INDIA RUBBER WORLD

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OUR 61st YEAR

A BILL BROTHERS PUBLICATION

SEPTEMBER, 1950

MORE SYNTHETIC RUBBER MEANS

GREATER SRF CARBON BLACK REQUIREMENTS

You can rely on

Sterling-S

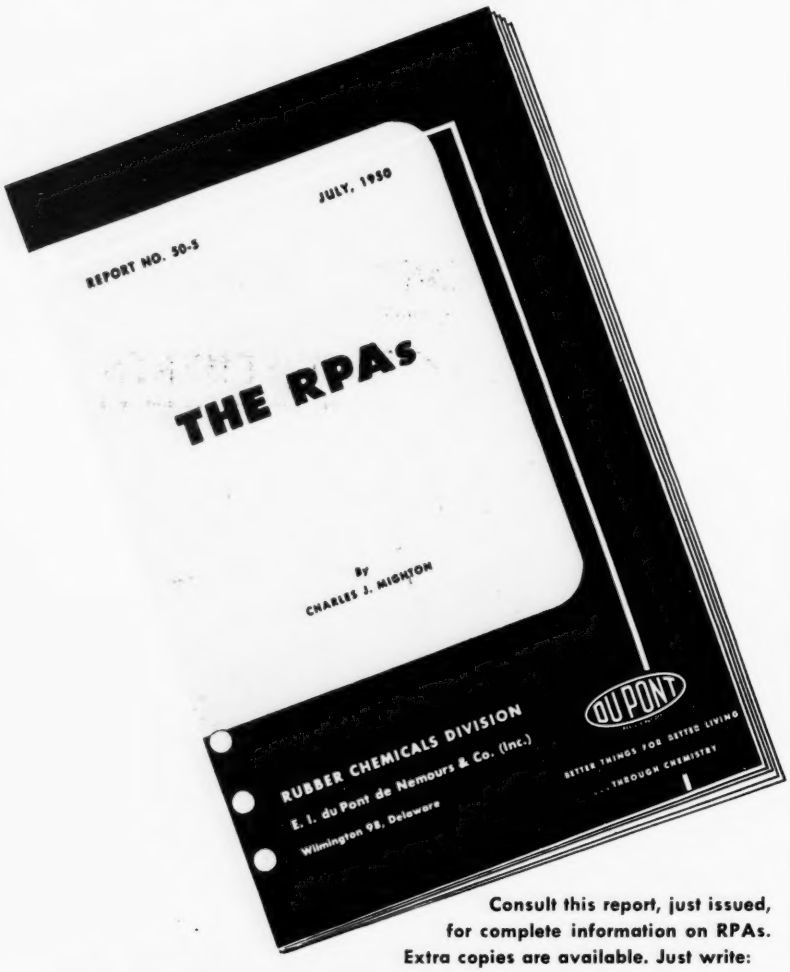
GODFREY L. CABOT, INC.

77 FRANKLIN STREET, BOSTON 10, MASS.

THIS REPORT TELLS YOU HOW TO

Reduce Breakdown Time
Improve Processability
Cut Power Consumption

with **DU PONT RPAs**



Consult this report, just issued, for complete information on RPAs. Extra copies are available. Just write:

DU PONT RUBBER CHEMICALS

E. I. du Pont de Nemours & Co. (Inc.), Wilmington 98, Del.

DU PONT
REG. U.S. PAT. OFF.

BETTER THINGS FOR BETTER LIVING ... *THROUGH CHEMISTRY*

RPA #2

SOLID FORM
For natural rubber and reclaim

Supplied in the form of waxy flakes, it is especially suited to open-mill breakdown of natural rubber. Its use materially reduces the time and power required for breakdown. From 0.15 to 0.50 part per 100 parts of rubber is recommended, depending on the time and temperature of milling. RPA No. 2 also aids in producing smooth-processing reclaim stocks.

RPA #3

LIQUID FORM
For natural rubber and reclaim

Preferred for peptizing natural rubber in a Banbury or plasticator because of its liquid form. With this peptizer, it is often possible to eliminate the second pass usually required when plasticating by mechanical means alone. The recommended amounts are the same as for RPA No. 2. It also helps produce smooth-processing reclaim stocks and aids in reducing the viscosity of rubber cements.

In "low temperature" GR-S, RPA No. 3 markedly improves processability . . . results in lower processing temperatures, less scorching, smoother extrusions. Concentrations of 1.0 part or more are generally recommended.

New, improved RPA #3RO

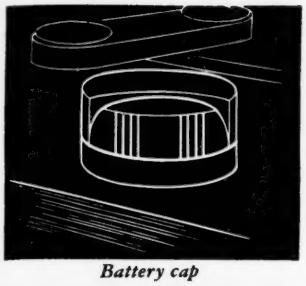
As a result of recent improvements, RPA #3RO now has none of the characteristic odor of RPA #3. The use of this new, improved product is recommended in all applications where odor is a problem.

RPA #5

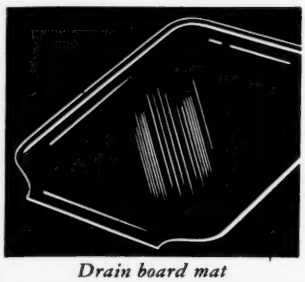
LIQUID FORM
For GR-S

Especially developed for breaking down GR-S. Its use effectively reduces breakdown time and power consumption . . . helps produce smoother processing stocks with reduced nerve and shrinkage. From 0.5 to 2.0 per cent RPA No. 5 is recommended for breakdown at high temperatures on a mill, or in a Banbury or plasticator.

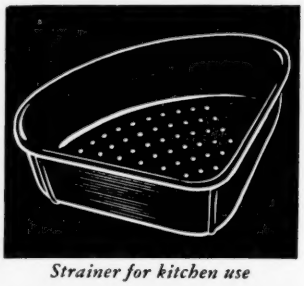
INDIA RUBBER WORLD, September, 1950, Vol. 122, No. 6. Published Monthly by BILL BROTHERS PUBLISHING CORP., Office of Publication, Orange, Conn., with Editorial and Executive Offices at 386 Fourth Avenue, New York 16, N. Y., U.S.A. Entered as Second Class Matter at the Post Office at Orange, Conn., under the act of March 3, 1879. Subscription United States and Mexico, $3.00 per year; Canada $4.00; All other Countries $5.00; Single Copies 35 cents. Address Mail to New York Office.



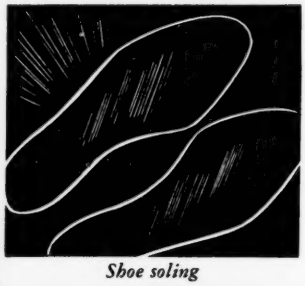
Battery cap



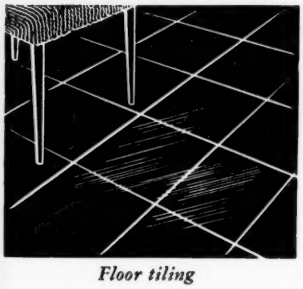
Drain board mat



Strainer for kitchen use



Shoe soling



Floor tiling

Good-rite

REG. U. S. PAT. OFF.

RESIN 50

easy-processing, reinforcing agent

Improves your rubber compounding

. . . gives faster, smoother extrusions

. . . saves time by eliminating masterbatching

Here's a reinforcing agent that helps rubber compounders make important savings—in a broad range of profitable products. Typical examples are shown here.

Good-rite Resin 50 provides an entirely new compounding approach to hardness problems . . . a simple means, for example, of filling in the gap between soft rubber compounds and ebonites.

Primarily a reinforcing agent, Good-rite Resin 50 has many extra advantages. It eliminates masterbatching, improves extrusions. It gives better flex life, higher elongation, better abrasion resistance. It makes rubber compounds more easily handled because it acts as a plasticizer at processing temperatures.

Made as a white, free-flowing powder, Good-rite Resin 50 can be compounded in a wide variety of attractive colors. Write for technical bulletin. Find out how Resin 50 may help you make more and better products at cost-savings. Please address Dept. CB-5, B. F. Goodrich Chemical Company, Rose Building, Cleveland 15, Ohio.

Hycar

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B. F. Goodrich Chemical Company

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If you would like a faster way

To process stocks—use **Philblack* A!**

A smoothie in more ways than one! This easy-processing, fast-curing black breaks down and plasticizes GR-S and reclaimed rubber stocks at a rapid rate! Produces more homogeneous mixtures, too, than those obtained with most other blacks. This greater uniformity means longer life in tire treads and carcass stocks.

Use Philblack A in inner tubes for strength, resilience and smooth finish . . . and in *any rubber product* where you need accuracy of extrusion and molding. Plenty of eye appeal, too! Philblack A is shipped in bags or bulk. Send your order today.

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or ***GR-S RUBBERS***

specify

NAUGATUCK TUEX

(TETRAMETHYL THIURAM DISULFIDE)

Available as powder or as dustless, fast-dispersing NAUGETS.®

- **in butyl —** Basic acceleration for tubes
- **in natural —** Primary accelerator without sulfur for high heat resistance

  Secondary accelerator with Thiazoles for fast cures in many sundry products
- **in GR-S —** A primary or secondary in general purpose compounding. Fast — but not persistent.

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Division of United States Rubber Company

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at Little Cost!

BEACOFINISH—a unique family of coating materials conceived to give your products greater durability and eye appeal. These highly concentrated wax emulsions that can be diluted with up to four parts of water can be used with the utmost safety and economy.

BEACOFINISH is therefore of four-fold importance to you:—

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3. ***It's Economical*** because its high dilution potential (without losing efficiency) allows one gallon to cover 15,000 sq. ft.
4. ***It's Safe*** being a wax in water emulsion, it eliminates the fire and health hazards of volatile-solvent based finishes.

BEACOFINISH can be applied by dipping, sponging, spraying or brushing—dries in about 20 minutes—faster if force-dried—to give a hard protective coating of great elasticity.

BEACOFINISH may be ordered in Neutral or Black, in varying degrees of luster from brilliant to dull. It is so concentrated, from one drum you can obtain potentially up to five drums of superior coating for your products.

CONSULT US—WRITE US TODAY

Let us show you how BEACOFINISH can make your products more attractive and saleable—protect them from damage—you from loss—in production and transit!

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PURITY · UNIFORMITY · DEPENDABILITY
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best buy for shoe soles

Tests prove you get more flexibility with PLIOLITE S-6 B

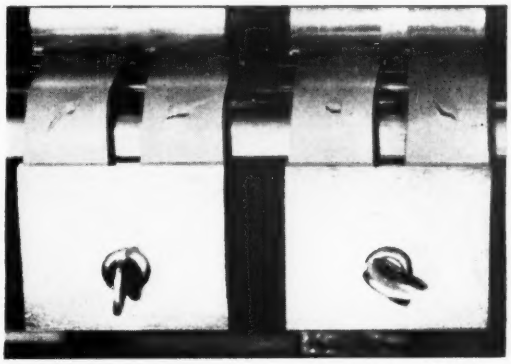
COMPARED with other resins available on the market, **Pliolite S-6 B** in shoe soles gave higher flexibility on the Ross Flex Test Machine, as shown in the inset photograph here. These pierced samples of soles made with Goodyear's new, truly easier processing resin showed markedly longer flex-life.

Shoe sole makers everywhere are turning to **Pliolite S-6 B** because of its ideal combination of qualities—lighter color, higher Shore hardness, low specific gravity, leathery "feel," and ready processability even under marginal Banbury or mill conditions.

This same combination of qualities makes this resin equally attractive to makers of flooring, molded and inflated rubber items, electrical insulation and a wide range of other products.

Why not see what **Pliolite S-6 B** offers you—by sending today for full details and samples for evaluation. Write:

Goodyear, Chemical Division, Akron 16, Ohio



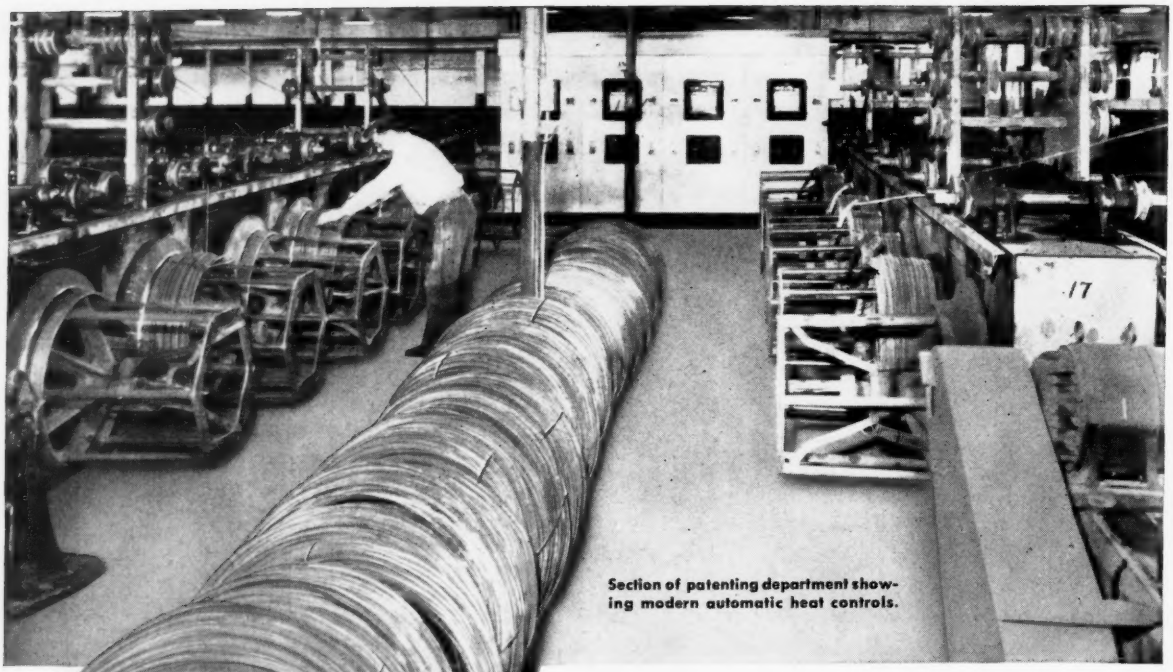
COMPETITIVE RESIN **PLIOLITE S-6 B SAMPLE**

Unretouched photograph illustrates cut-growth of pierced samples of shoe soles made with **PLIOLITE S-6 B**, on right, and a competitive resin, on left. Samples are in duplicate. Compounds differ only in the type of resin used. Note greater resistance to cracking exhibited by the **PLIOLITE S-6 B** sole at equivalent flexing.

USE PROVED Products

Pliolite—T.M. The Goodyear Tire & Rubber Company, Akron, Ohio

GOODYEAR



Section of patenting department showing modern automatic heat controls.

wire control

to save you money!

• The accuracy with which your wire specifications are met, *and held,* quite naturally has an important bearing on the cost, speed and quality of your production. That's why you can profit by National-Standard's facilities and exceptional experience in producing special wire . . . either single or in fabricated braid and tape for tires and all other wire-in-rubber products.

Here, all phases of wire processing . . . drawing, cleaning, heat treating, plating, finishing . . . are controlled to a degree and accuracy never exceeded, not often equalled. It's a firmly rooted National-Standard policy that can save you time and money.

Remember, too, another National-Standard policy that can work to your advantage—highly qualified engineering service in the development and application of special wire to solve special problems. As always, it's yours for the asking.

NS NATIONAL-STANDARD Company NILES, MICHIGAN

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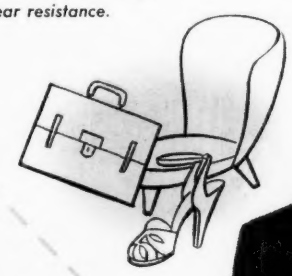
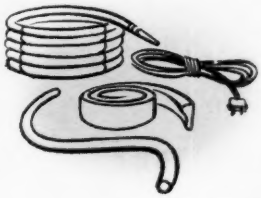
ATHENIA STEEL.. *Clifton, N. J.*	Flat, High Carbon, Cold Rolled Spring Steel
NATIONAL-STANDARD.. *Niles, Mich.*	Tire Wire, Fabricated Braids and Tape
WAGNER LITHO MACHINERY.. *Jersey City, N. J.*	Lithographing and Special Machinery
WORCESTER WIRE WORKS.. *Worcester, Mass.*	Round Steel Wire, Small Sizes

Marvinol-based calendered sheets have superior "dry hand" . . . are easily worked . . . have high stitch-tear resistance.



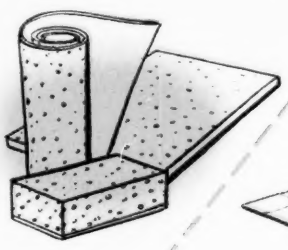
Cast, calendered or extruded Marvinol-based films have high tear strength . . . are easily processed, printed, embossed, sewn or heat-sealed.

Marvinol pays off with faster extrusion rates . . . makes end products with high resistance to cut-through, good electrical qualities.



Adaptable to injection, low pressure, compression, slush and blow molding, Marvinol gives strong, durable products with sharp detail.

Marvinol is being used in new vinyl compositions to make tough, lightweight cellular products.



Colorful, durable, high-style floor coverings are processed from high molecular weight Marvinol formulations.

FOR SUPERIOR physicals, Marvinol VR-10. For ease in processing, plus good physicals, Marvinol VR-20. Now both Marvinol resins give processors the characteristics that make sales. Stability under heat, light and time; dimensional stability; low temperature flexibility; resistance to wear, tear, oils and acids.

Let us show you how to utilize these extras in Marvinol. All technical information developed in our modern laboratories is at your disposal since it is through you that Marvinol-based products reach the consumer. Write today for the latest technical information. Dept. W-9, NAUGATUCK CHEMICAL, Naugatuck, Connecticut. *In Canada*, Naugatuck Chemical, Elmira, Ontario.

Other Products of Naugatuck Chemical:

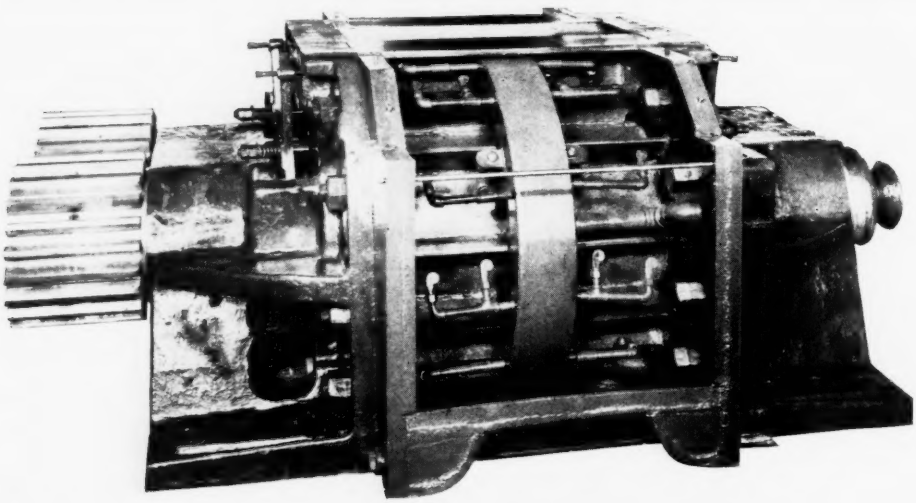
KRALAC molding powders • VIBRIN Polyester resins • PQL chemical and heat resistant baking enamel • SHRINKMASTER process for rendering woolens shrink-resistant and long-wearing • SPERGON fungicide for seed treating • TUFOR 2-4-D weed killers • PHYGON orchard and row crop spray fungicide • SURFA-SEALZ rubber compound for surfacing highways • LOTOL compound latices, natural and synthetic • DISPERSITE water dispersions of reclaimed rubber and resins • Reclaimed Rubber • Aromatics • Synthetic Rubber • Rubber Chemicals • Raw Latex • Plasticizers

Marvinol

NAUGATUCK CHEMICAL

DIVISION OF UNITED STATES RUBBER COMPANY

. . . FASTER AND BETTER REBUILDING . . . FASTER AND BETTER REBUILDING . . .



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EXPERT BANBURY REBUILDING

Prudence — and past experiences . . . again dictate the wisdom of putting production facilities into tip top shape at once — ready for any emergency.

Your Banbury Mixer equipment is a MOST IMPORTANT link in the production chain. Check it now. A limping mixer is a liability.

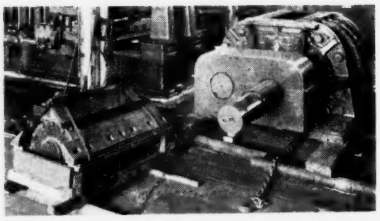
Here for you is remarkably quick service in completely rebuilding, and hard-surfacing, any size or type Banbury body. Every job is guaranteed. Every part restored to original dimensions and efficiency.

Place your Banbury in the qualified hands of VETERANS in the specialized business of mixer rebuilding. Our service is now faster and more efficient than at any time in our sixteen years experience.

Call or wire us for estimates . . . for action . . . for results. Time saved is vital — and is money earned for you.

Ready FOR QUICK SHIPMENT - - SALE OR INTERCHANGE

We have ready several No. 9 and No. 3A spray type bodies, with door and cylinder, all completely rebuilt and in A1 shape. Also jacketed-type bodies. Will sell or exchange. You ship old body to us after ours is installed and in operation. Wire reservations.



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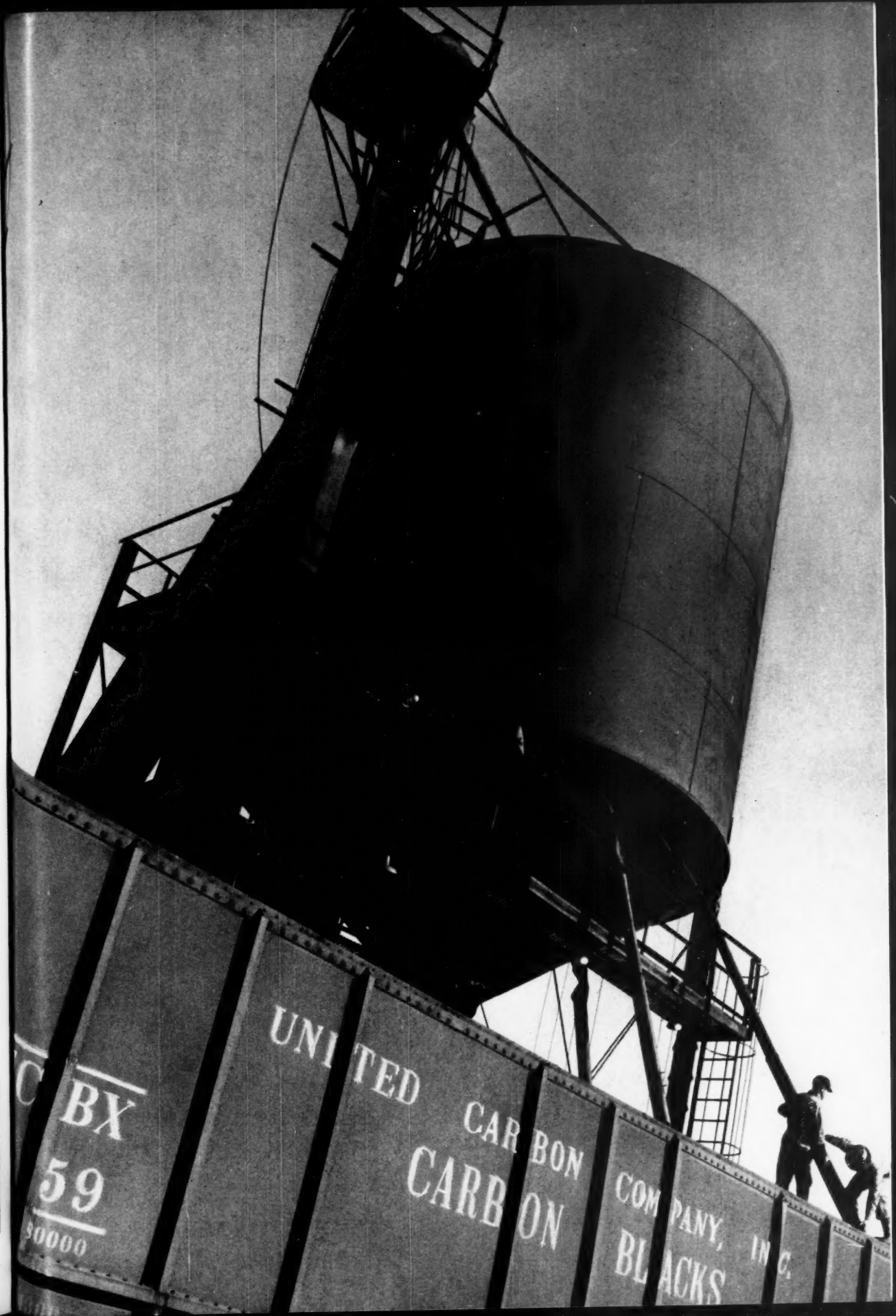
UNITED CARBON COMPANY, INC.
CARBON BLACKS
BX
59
50000

UNITED BLACKS, made with engineering and scientific skill to meet the needs of the rubber industry, are "packaged" to suit the convenience of the user. In this photo a hopper car is being filled; distinctive United Carbon bags, plainly printed for ease in handling and selecting, are another medium which United uses to make handling convenient, fast, and easy for the user.

Check the Advantages of

KOSMOS 40

AN HMF BLACK

PACKAGED IN BLACK BAGS WITH DISTINCTIVE GREEN PRINTING

LOW COMPOUNDING COST
WIDE FLEXIBILITY
EASY PROCESSING
FAST RATE OF CURE
COOL MIXING
MINIMUM CUT GROWTH

HIGH REINFORCEMENT
HIGH RESILIENCY
LOW HEAT BUILD-UP
RAPID EXTRUSION
MINIMUM FLEX CRACKING
GOOD AGING

For economy, exceptional performance, and all-around satisfaction standardize on Kosmos 40, an HMF (high modulus furnace) black.

RESEARCH DIVISION

UNITED CARBON COMPANY, INC.

Charleston 27, West Virginia

PURECAL M

DOUBLES

FLEX RESISTANCE

There's no need to take a chance on variable reclaim when you compound Wyandotte *Purecal* M* and rubber. This uniform reclaim substitute doubles flex resistance. But that's not all.

Purecal M will increase tensile strength, elongation and tear resistance by at least 50%. Its milling and dispersing qualities are excellent over the whole range of loading. It shortens cures, remains non-scorchy. And because Purecal M is white, it allows you to choose any color you wish for the finished product.

We suggest that you write for our new 40-page booklet, "PURECAL IN NATURAL RUBBER." It describes Wyandotte's three grades of Purecal. It compares them by particle size and physical properties with other non-black fillers. The booklet costs you nothing. And it may save you money.

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SODA ASH • CAUSTIC SODA
BICARBONATE OF SODA
CALCIUM CARBONATE • CALCIUM CHLORIDE
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PROPYLENE DICHLORIDE
AROMATIC SULFONIC ACID DERIVATIVES
OTHER ORGANIC AND INORGANIC CHEMICALS

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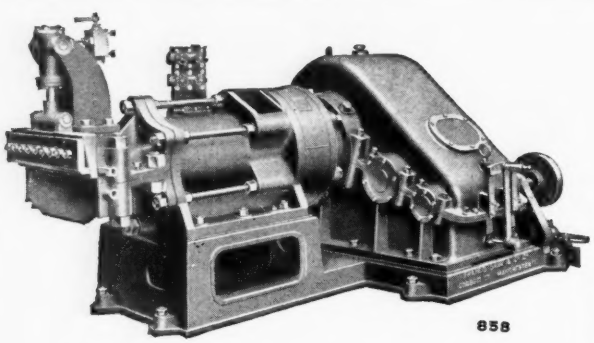
RUBBER EXTRUDERS



An 8-inch Shaw Extruder
for Tyre Tread Production

We have been making all types of extruders for the rubber industry since 1879

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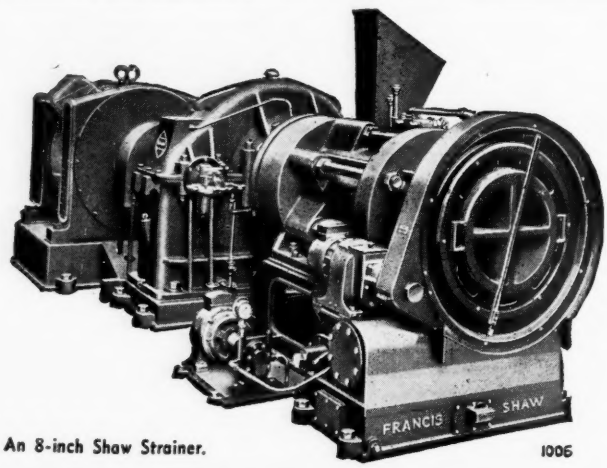
Your enquiries will receive the benefit of over 65 years experience in the design and manufacture of sound machines.

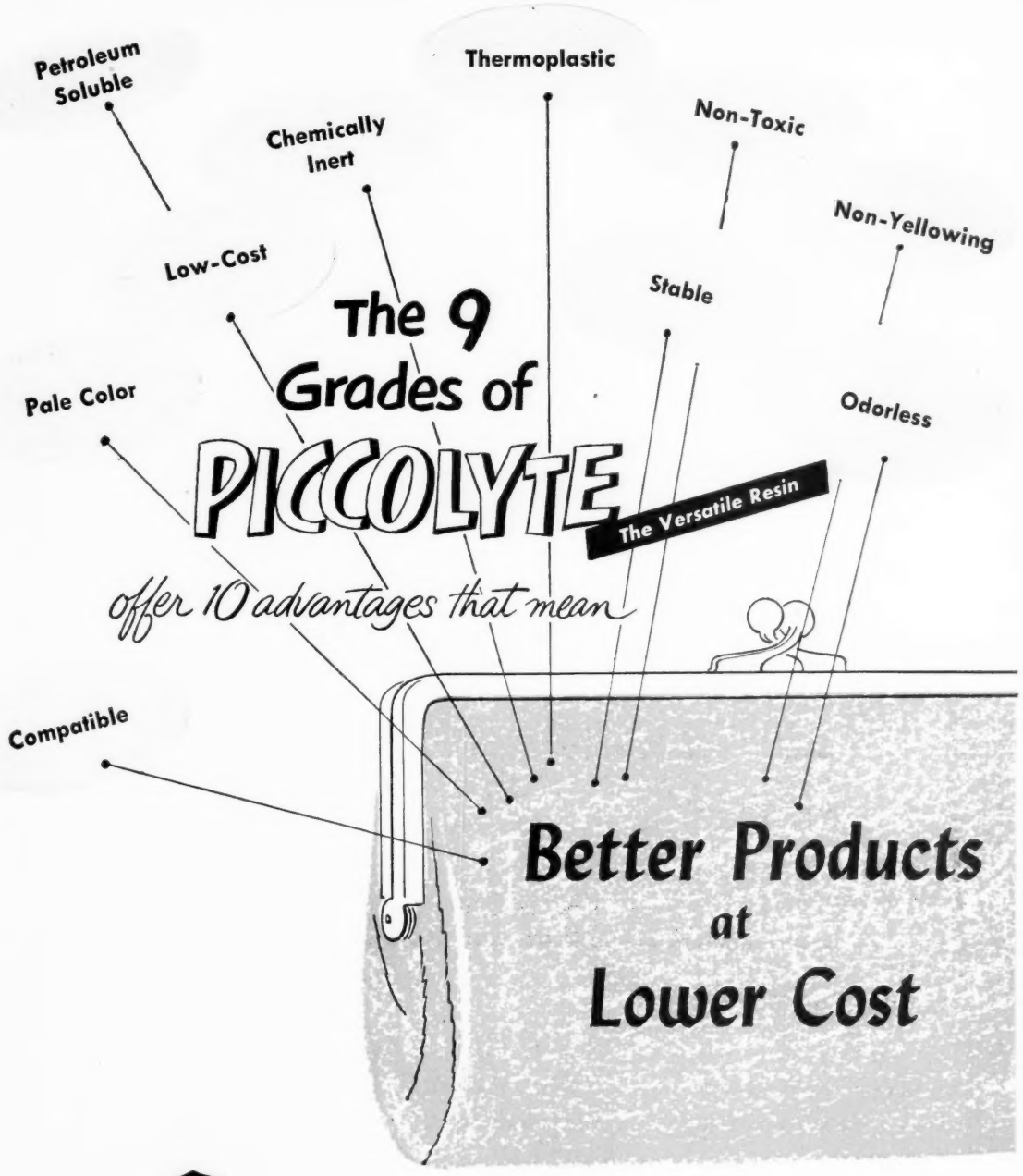
WE CAN EQUIP COMPLETE TYRE PLANTS AND GENERAL RUBBER PROCESSING FACTORIES WITH MACHINERY PRODUCED ON MODERN PLANT BY SKILLED WORKMEN AND TECHNICIANS.



An 8-inch Shaw Strainer.

FRANCIS SHAW & CO. LTD. MANCHESTER 11 ENGLAND

R-138



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Clairton, Pennsylvania

Plants at Clairton, Pa.; West Elizabeth, Pa.; and Chester, Pa.

Distributed by Harwick Standard Chemical Co., Akron 5, Ohio

Piccolyte puts money in your pocketbook, because of the opportunities for cost-savings and product-improvement it provides.

Not only is Piccolyte low in cost, but it is soluble in low-cost petroleum solvents, thus presenting you with a double saving. It is pale in color and stable; it is chemically inert, non-toxic and compatible with other resins and ingredients.

We will be glad to send you full information on this remarkable synthetic resin, and free samples. Please state the nature of your application, so that we can send a suitable grade.

DOUBLE-CHECKED ✓ CHEMICALS FOR THE RUBBER INDUSTRY

A New Sharples Accelerator:

MERAC

A LIQUID ACCELERATOR FOR LATEX— NATURAL and SYNTHETIC

✓ SIMPLIFIES LATEX COMPOUNDING

✓ ADD DIRECTLY TO LATEX

✓ NO GRINDING OR BALL MILLING NECESSARY

Merac Offers these Advantages:

1. It is a liquid accelerator which upon dilution with water is added directly to latex.
2. It is faster curing at room and elevated curing temperatures than most accelerators.
3. It imparts high modulus and tensile strength with flat curing and good aging characteristics.
4. Its use provides compounded latex formulations which are stable on storage, exhibiting only moderate changes in viscosity.

PROPERTIES

Color—	Deep red to brown liquid
Odor—	Characteristic
Sp. Gr.—	1.034 at 20°C.
Solubility—	Miscible with water Soluble in alcohol

For technical information write to Dept. P.

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LOOKING FOR A REINFORCING PIGMENT THAT COSTS YOU LESS

—yet Maintains Compounding Performance and Results?

CALCENE T®

MAY BE YOUR ANSWER

Write for this Free Bulletin!

Pigment Data Bulletin 50-1, just published, shows delivered pound volume cost savings of Calcene T, as compared with some of the thermal blacks, at typical destinations. Write for it today!

Your name will be added to the mailing list to receive this bulletin, as well as our rubber compounding bulletins, as they are prepared on Columbia Pigments.

When compared with various other widely used pigments, Calcene T makes possible substantial savings in many cases on delivered pound volume cost.

The ease and feasibility of using Calcene T to replace costlier pigments—either fully or partially—*plus* the good possibility that Calcene T will provide better compounding and product performance, warrant your prompt investigation.

Free working samples of *CALCENE T*—as well as Columbia's other pigments, *SILENE EF* and *HI-SIL*—are available upon request. Pittsburgh Plate Glass Company, Columbia Chemical Division, Fifth Avenue at Bellefield, Pittsburgh 13, Pennsylvania.

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No Sir! We have a story to tell

A Story of

Easier Processing

Lower Power Consumption

Better Physical Properties

Fewer Rejects

Bigger Savings

All of these advantages, plus many more, when you use MARBON "8000"

For the *Complete* Story

write:

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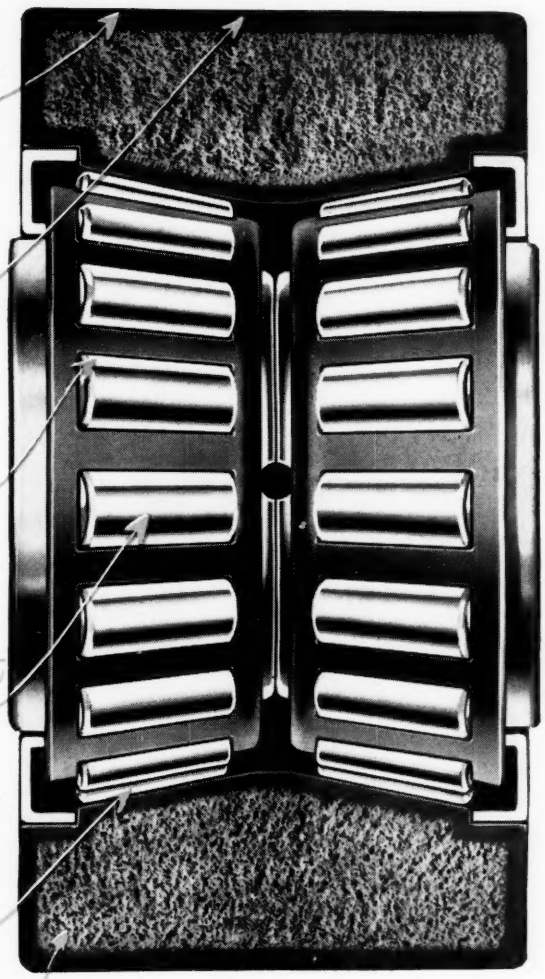
MARBON CORP.
GARY INDIANA

Less scuffing and scoring in sheet levellers, with TIMKEN® bearings as back-up rolls


Surface is finished to 15 micro inches
Outer race of bearing itself forms the back-up roll
Friction practically eliminated
Tapered design reduces end movement
Line contact between rollers and races gives extra load capacity
Has extra heavy race

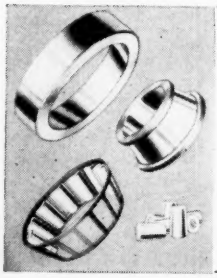
THE Timken® bearing shown here is especially designed to operate as a bearing and back-up roll, all in one! The outer race of the bearing itself forms the back-up roll.

With Timken bearings as back-up rolls in sheet levellers, marking of the sheets is reduced to a minimum. One reason is the almost complete absence of friction in Timken bearings. Timken bearings can be accelerated to top speed with minimum drag between rolls. This makes for less scuffing and scoring of the work rolls—less chance of marking the sheets.

Another non-marking feature of Timken bearings is their extremely smooth surface finish. Timken bearings for back-up rolls have a surface finish on the cup OD of 15 micro inches.

Timken bearings offer many other advantages for sheet levellers. Line contact between rollers and races gives them the extra capacity to take the leveller's tremendous radial loads. They permit tighter closures which retain lubricants better. They reduce wear on related parts. And they normally last the life of the machine.

Plan now to use Timken bearings as back-up rolls in your sheet levellers. For full information and engineering data on this application, write us on your company letterhead. And wherever you use tapered roller bearings, always insist on the trademark "Timken". The Timken Roller Bearing Company, Canton 6, Ohio. Cable address: "TIMROSCO".



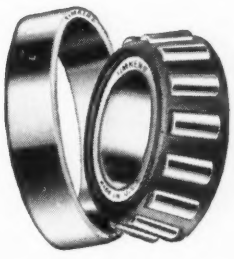
DESIGN LEADERSHIP

The first Timken tapered roller bearing was produced in 1898. Since then the one-piece multiple perforated cage, wide area contact between roll ends and ribs, and every other important tapered roller bearing improvement have been introduced by The Timken Roller Bearing Company.

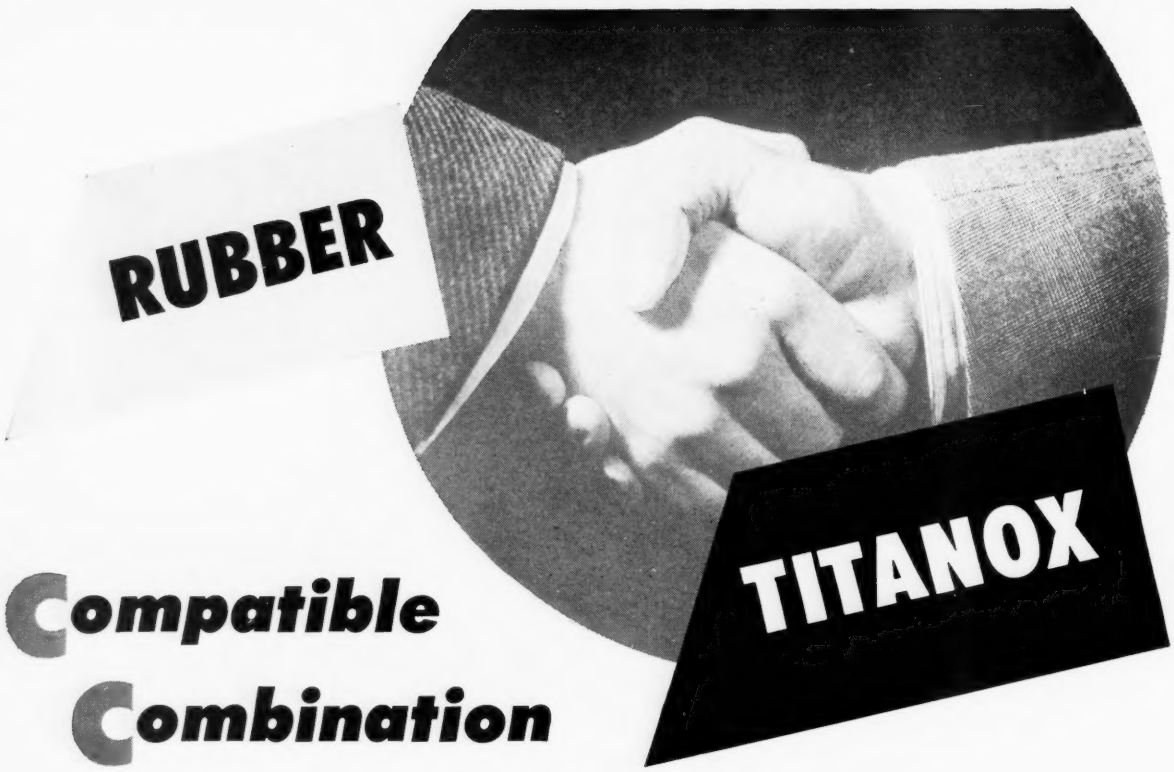
The Timken Company leads in: 1. advanced design; 2. precision manufacture; 3. rigid quality control; 4. special analysis steels.

TIMKEN

TAPERED ROLLER BEARINGS



NOT JUST A BALL ○ NOT JUST A ROLLER ▭ THE TIMKEN TAPERED ROLLER ▭ BEARING TAKES RADIAL AND THRUST ◎ LOADS OR ANY COMBINATION



Compatible Combination

for QUALITY products

Properties to fit any end-use of rubber are attainable today through the use of natural and synthetic rubbers, singly or in combination—to meet the service demanded from many articles—from footwear to white wall tires to electrical wire insulation. In these specific compounds the intrinsic properties of the elastomer are retained and fortified in whites and light tints secured with TITANOX pigments which are compatible with all types of rubber.

The long-established anatase titanium dioxide TITANOX-A-LO or A-MO has set a standard for whiteness and tint-clarity, but the greater brightening power of the rutile titanium dioxide TITANOX-RA may be preferred where pigment loading must be minimized. Recent studies indicate that TITANOX-RA-NC — the weather-resistant rutile titanium dioxide — may reduce checking and cracking in white wall tire compounds. In heavily loaded stocks the rutile-calcium pigment TITANOX-RCHT offers high volume per pound of pigment through its stable calcium sulphate extender. This pigment, however, is not compatible with latices which are better pigmented with TITANOX-A-LO or the water dispersible TITANOX-A-WD; or for greater opacity, TITANOX-RA.

The fine particle size of all TITANOX pigments makes them readily and completely dispersible with the usual type of rubber equipment. Our Technical Service Department is ready at all times to help you with your problems on pigmenting rubber. Titanium Pigment Corporation, 111 Broadway, New York 6, N. Y.; 104 South Michigan Avenue, Chicago 3, Ill.; 2600 South Eastern Avenue, Los Angeles 22, Calif. Branches in all other principal cities.

® TITANOX

the brightest name in pigments

TITANIUM PIGMENT CORPORATION

Subsidiary of NATIONAL LEAD COMPANY

8318

Announcing:

PITTSBURGH PX PLASTICIZERS

a new wide range line

from a single producer

Pittsburgh Coke & Chemical Company is now producing ten quality-controlled Pittsburgh PX Plasticizers—providing the plastics, rubber, and protective coatings industries with a new, reliable source of supply.

The objective of the Plasticizer Division is to make available from one integrated source of supply a line of highest quality plasticizers in sufficient variation of type to fill virtually every need. Pittsburgh Coke & Chemical Company's integrated operations, from the mining of coal to the purification of the finished plasticizer, permit quality control of all manufacturing steps. The Company's position as a raw material producer gives maximum assurance of continuity of supply.

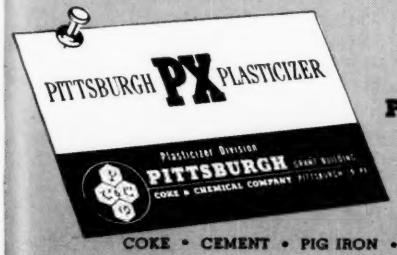
Established evaluation facilities provide our customers with excellent technical service, while continuing research will provide new and improved products for the future.

Descriptive literature on Pittsburgh PX Plasticizers is available upon request. Please address your inquiries to:

Pittsburgh PX Plasticizers

- PX-104 DiButyl Phthalate
- PX-108 DiIsoOctyl Phthalate
- PX-138 DiOctyl Phthalate
- PX-208 DiIsoOctyl Adipate
- PX-209 DiNonyl Adipate
- PX-404 DiButyl Sebacate
- PX-408 DiIsoOctyl Sebacate
- PX-658 TetraHydroFurfuryl Oleate
- PX-916 TriPhenyl Phosphate
- PX-917 TriCresyl Phosphate

Check the above list for your needs—then write today for individual bulletins which give full commercial and technical information about each of the Pittsburgh PX Plasticizers.



Plasticizer Division

PITTSBURGH COKE & CHEMICAL COMPANY

1960 Grant Building • Pittsburgh 19, Pa.

COKE • CEMENT • PIG IRON • PLASTICIZERS • COAL CHEMICALS • ACTIVATED CARBON • PROTECTIVE COATINGS
AGRICULTURAL CHEMICALS • SYNTHETIC ORGANIC CHEMICALS

PROTECT
your vinyl plastics
AGAINST BOTH LIGHT AND HEAT
...with these
"Dutch Boy" Stabilizers

"DUTCH BOY" DYPHOS

Dibasic Lead Phosphite. The outstanding heat and light stabilizer for vinyl chloride polymers and copolymers. Dyphos is unexcelled in providing protection against the deleterious effects of *both* heat and light.

The remarkable effectiveness of Dyphos makes it possible to utilize chloroparaffins as low cost flame-resistant secondary plasticizers in quality products. Dyphos is also highly effective in plastisols and organosols.

TRADE NAME	CHEMICAL COMPOSITION	RECOMMENDED FOR USE IN
"Dutch Boy" Tribase	Tribasic Lead Sulphate	Electrical compounds
"Dutch Boy" Tribase E	Basic Lead Silicate Sulphate Complex	Low volume cost insulation
"Dutch Boy" DS-207	Dibasic Lead Stearate	Sheeting, extrusion and molded compounds, i.e., insulated wire and vinyl phonograph records
"Dutch Boy" Plumb-O-Sil A	Coprecipitate of Lead Orthosilicate and Silica Gel	Translucent and colored sheeting and upholstery stocks
"Dutch Boy" Plumb-O-Sil B	Coprecipitate of Lead Orthosilicate and Silica Gel	Translucent film and sheeting, belting
"Dutch Boy" Plumb-O-Sil B Electrical Grade	Coprecipitate of lead Orthosilicate and Silica Gel	Highgrade insulated wire and sheeting
"Dutch Boy" Dythal	Dibasic Lead Phthalate	General purpose stabilizer for heat and light
"Dutch Boy" Dyphos	Dibasic Lead Phosphite	Excellent for heat and light in all opaque stocks including Plastisols and Organosols
"Dutch Boy" Normasal	Normal Lead Salicylate	Vinyl flooring compounds. Rubber stocks as non-scorch activator

"DUTCH BOY" TRIBASE

Tribasic Lead Sulphate plus

"DUTCH BOY" DS-207

Dibasic Lead Stearate

The popular combination for good, all-around performance. Combines heat stability, light fastness and lubricity in processing.

"DUTCH BOY" DYTHAL

Dibasic Lead Phthalate. An excellent absorber of ultra-violet light, Dythal promotes light fastness in organic films. This advantage, combined with rugged heat stability derived from the basic character of this compound, makes Dythal the *general purpose stabilizer.*

Accelerated tests in the laboratory, plus outdoor exposure tests, show that Dyphos, Dythal, and Tribase—DS-207 greatly increase the useful life of plastic compounds.

For example, a compound containing Dyphos withstood over 2000 hours in the Weatherometer before failure.

"Dutch Boy" Stabilizers are a product of National Lead Company.

Our technical staff will help you stabilize vinyl resins for any use. Write for complete information.

Dutch Boy PRODUCTS

Reg. U.S. Pat. Off.

Dutch Boy

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CHEMICALS

NATIONAL LEAD COMPANY

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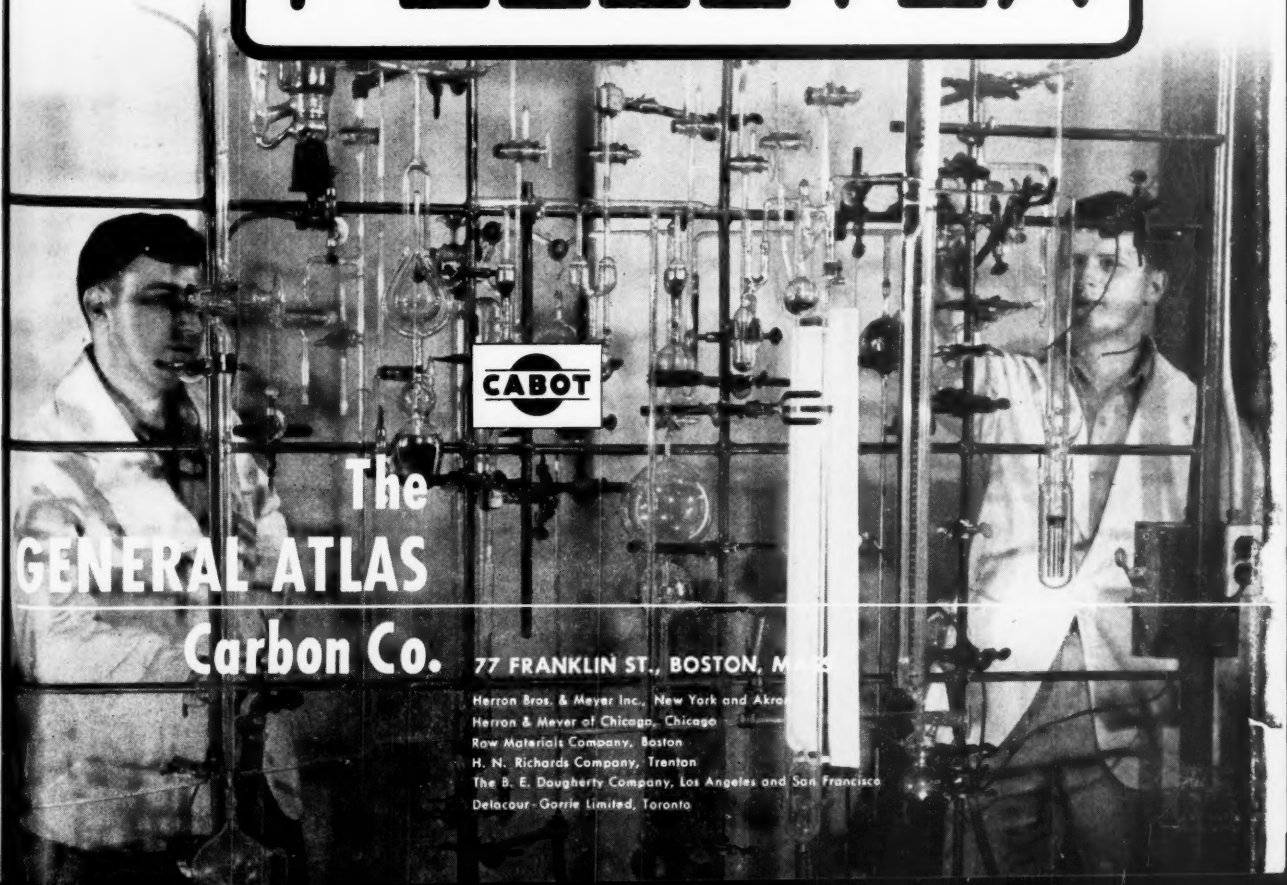
When it's PELLETEX you KNOW...

It's the BEST

A visit to a PELLETEX plant shows the latest and best refinements of process and equipment. Every step from gas to black is under scientific control. Trained engineers keep those controls keyed to perfection. Laboratory men, production men, maintenance crews, shippers and packers — all experts in their fields — work harmoniously to bring you the best in SRF carbon black — PELLETEX.

Efficiency at the plant is reflected in the uniform high quality of PELLETEX, the ideal semi-reinforcing carbon pigment for the rubber manufacturer.

PELLETEX



The GENERAL ATLAS Carbon Co.

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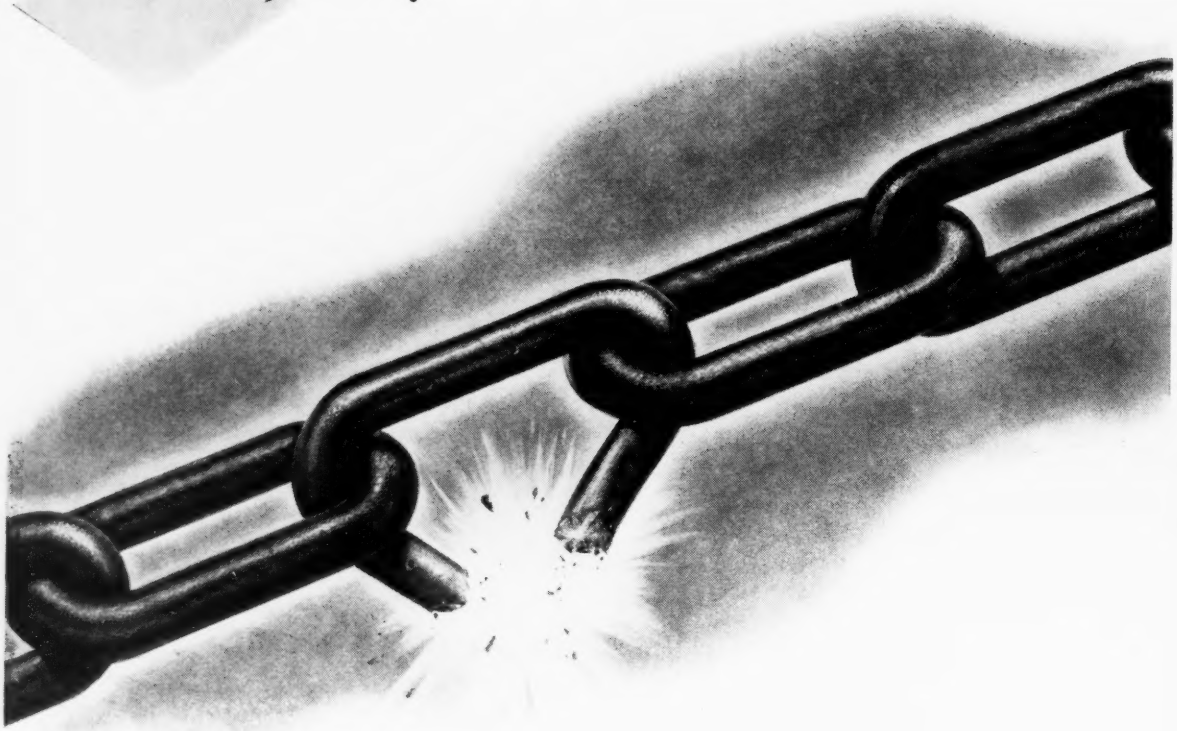
Herron Bros. & Meyer Inc., New York and Akr
Herron & Meyer of Chicago, Chicago
Raw Materials Company, Boston
H. N. Richards Company, Trenton
The B. E. Dougherty Company, Los Angeles and San Francisco
Delacour-Garrie Limited, Toronto

Chemicals you live by



An old adage applies to Vinyl Plastics

The extender you use in your vinyl plastic can be the weak link in the finished product if it falls short in purity or uniformity.

You expect high standards of quality in resins, plasticizers and stabilizers because they are *chemically produced* under scientifically controlled conditions. You are assured of equally high standards in your vinyl extender when you specify one of DIAMOND's line of Precipitated Calcium Carbonates, since they, too, are *chemically produced*, with resultant close control of purity and uniformity.

DIAMOND ALKALI makes eight grades of Precipitated Calcium Carbonates, in a wide range of particle sizes, and with various physical and chemical properties. Our Technical Service Staff is available to work with you to determine which grade best suits your requirements. Just call your nearest DIAMOND Sales Office, or write us direct.

DIAMOND PRECIPITATED CALCIUM CARBONATES: Multifex*, Super Multifex*, Multifex MM*—Kalite*, Millical*, Suspenso—Non-Fer-Al*, Surfex*.

WRITE FOR OUR BULLETIN ***"Dispersing Calcium Carbonates in Vinyl Plastics".***

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DIAMOND SALES OFFICES: Boston, New York, Philadelphia, Pittsburgh, Cleveland, Cincinnati, Chicago, St. Louis, Memphis, Houston.

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DIAMOND CALCIUM CARBONATES

DIAMOND ALKALI COMPANY . . . CLEVELAND 14, OHIO

DIAMOND ALKALI CHEMICALS

meet the "POLLY TWINS" ✪ Polycizer 332 AND 162

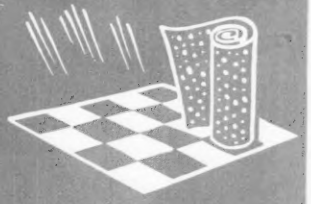
These two new plasticizers — POLYCIZER 332 and POLYCIZER 162 — can bring decided improvements to your vinyl and other synthetic resin and rubber products . . . They can help reduce production costs, too, by making it possible to use a lower plasticizer content or a higher filler load without impairing product quality.

POLYCIZER 332 (Dioctyl Adipate) is free from odor, is low in acidity and practically colorless. It is recommended for use either as an entire or partial plasticizer in calendering, molding, extruding, organosol and plastisol processes . . . POLYCIZER 162 (Dioctyl Phthalate) is also odorless, low in acid and practically colorless. It is recommended as an all-purpose plasticizer for use with all types of resins and rubbers.

Write for complete data

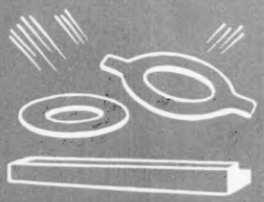
In Vinyl Extrusions:
For improved heat resistance, higher loading without exceeding hardness requirements, better low-temperature properties, good light stability . . . it's POLYCIZER 332, or for better general plasticizing . . . it's POLYCIZER 162.

In Heavy-Loaded Sheet:
For good heat and light stability . . . it's POLYCIZER 162. For lower plasticizer content or higher filler load without impairment of quality . . . it's POLYCIZER 332.



In Film Sheeting, Plastisols, Organosols:
For low volatility, better heat and light stability, less odor . . . it's POLYCIZER 162. For better low temperature properties, better hand and drape . . . it's POLYCIZER 332.

In Oil-Resistant Rubbers:
For better plasticizing, softer stocks, extreme low-temperature flexibility and low volatility . . . it's POLYCIZER 332. For better plasticizing with low volatility . . . it's POLYCIZER 162.



✪ POLYCIZER is a name registered as a Trade Mark by the Harwick Standard Chemical Co.

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AKRON, OHIO

BRANCHES: BOSTON, TRENTON, CHICAGO, LOS ANGELES

Do your rubber products have
the sniff that **sells?**

Use Du Pont **"Alamask"** odorants
TRADE MARK

Give your rubber products more customer appeal with "Alamask" odorants! Often times, it's the sniff that *sells*.

Here are some specific—and successful—end uses for new "Alamask" odorants: For rug underlays (natural and synthetic, open or closed cell structure): "Alamask" LD, "Alamask" 6390, "Alamask" O. For blown natural-sponge pillow and mattress stock: "Alamask" O. For shoe adhesives, from natural latex: "Alamask" ND, from synthetic latex: "Alamask" 6337, "Alamask" 175. For rug backings: "Alamask" LD, "Alamask" ND. For natural smoke sheets: "Alamask" O.

Du Pont **"Alamask"** odorants
TRADE MARK

Find out more! Send for the booklet "Odorants for the Rubber Industry"—or ask us for specific recommendations for your individual problems. Write—E. I. du Pont de Nemours & Co. (Inc.), Organic Chemicals Department, Aromatics Section, Wilmington 98, Delaware. Branch Offices: Atlanta, Boston, Charlotte, Chicago, New York, Philadelphia, Providence, San Francisco.

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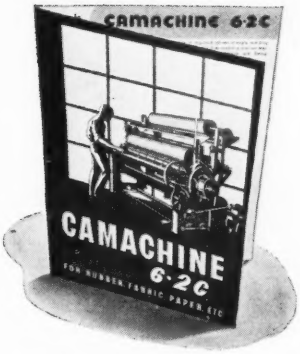
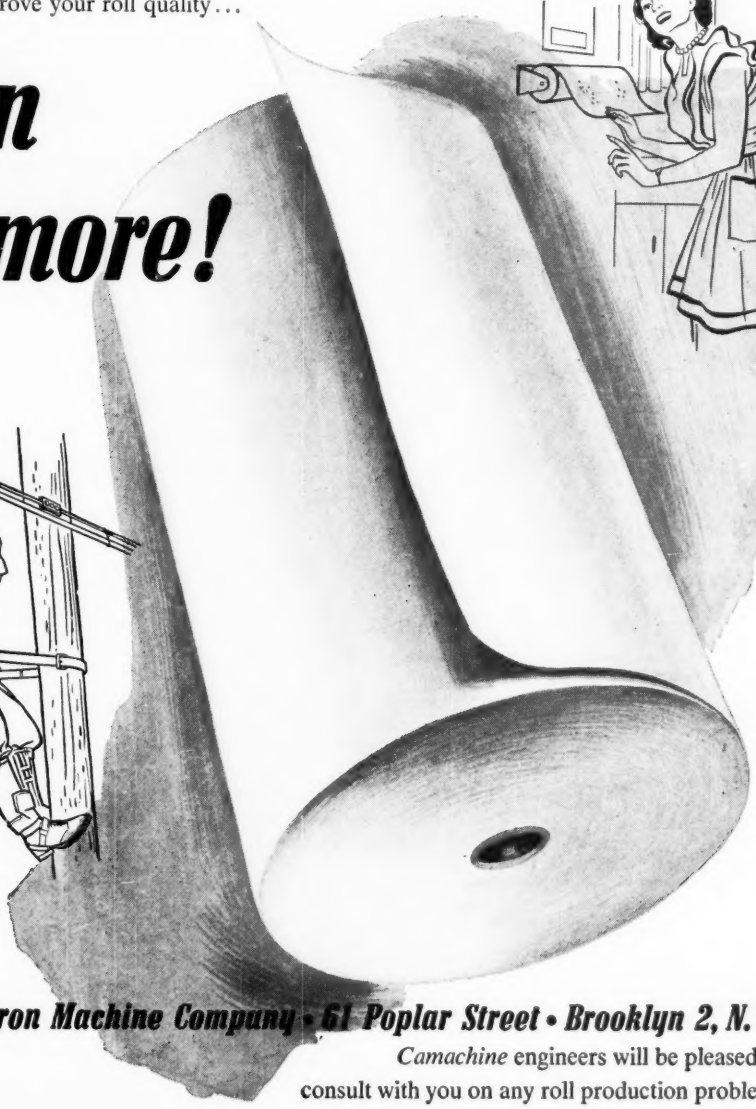
New Camachines® are designed and built with the conviction that *all* users of roll products *prefer* the advantages of a quality roll. Certainly that is true of the pressman in the newspaper plant where independent tests have proved the superiority of *Camachine* newsprint rolls. It's also true of the electrician taping a hot wire. Or the accountant using an adding machine. Or the housewife using dozens of roll products in her daily chores. It makes no difference what roll product you make. When the right modern *Camachine* helps to improve your roll quality...



For fast production of top quality rolls of plain and friction-coated fabrics, proofed goods, natural and synthetic rubber goods, and similar materials, investigate the *Camachine 6-2C*.

you can sell more!



Cameron Machine Company • 61 Poplar Street • Brooklyn 2, N. Y.

Camachine engineers will be pleased to consult with you on any roll production problem.

AA-2258

How Skellysolve helps 3 men Reach 1 Goal . . .

THE CHEMIST

finds that Skellysolve will enable the plant to make rubber cements with the properties he desires. So he informs

THE PURCHASING AGENT,

who orders a tank car of Skellysolve. The result is a superior compound which makes

THE SALES MANAGER'S

job easier. His tape customers are better satisfied, and the special qualities of his compound help him get new business from other users of rubber cements.

Selling More and Better RUBBER CEMENTS

"DOC" MacGEE SAYS: You'll find this happening in several other branches of the rubber industry. Thus, if you use benzol, rubber solvent gasoline, toluol, ether, carbon tetrachloride or other solvents either in fabricating operations or in making rubber cements, find out what Skellysolve can do for you. Learn, too, about Skellysolve's famed dependability of supply . . . and the technical help you may receive from a Skellysolve Technical Fieldman.

the Rubber Industry and Skellysolve

There are six different Skellysolves for making rubber cements and for use in other rubber fabricating operations. Skellysolve has a minimum of greasy residues, thereby giving quick drying and high tensile strength. It is less toxic than many solvents, thus reducing health hazards. It has a minimum of unsaturates and impurities, thereby reducing the tendency to thin or gel. Its low vapor pressure eliminates bloated tubes or cans, and its sweet odor makes it pleasant to work with.

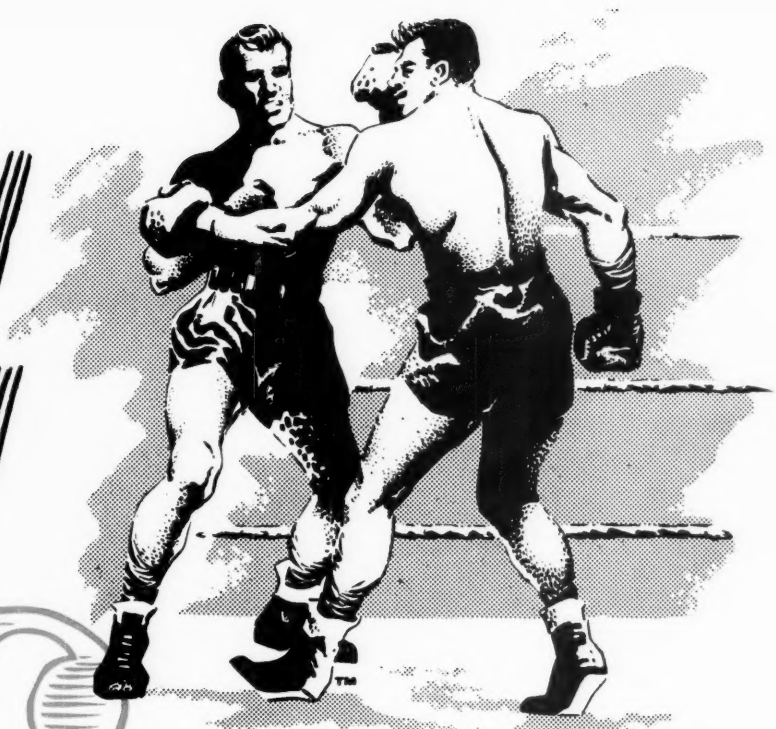
SKELLY

Skellysolve

SOLVENTS DIVISION, SKELLY OIL COMPANY, KANSAS CITY, MO.

pound for Pound

YOU CAN'T BEAT



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Pound for pound, CRYSTEX contains more insoluble sulphur . . . it's guaranteed to be 85% insoluble in Carbon Bisulphide. When you compare the price of CRYSTEX in relation to this extremely high insoluble sulphur content, you'll find CRYSTEX to be less expensive. In fact, by this per unit comparison, CRYSTEX is the most economical insoluble sulphur on the market.

Let us send a generous testing sample and the very latest technical and use data on CRYSTEX Insoluble Sulphur.

OTHER STAUFFER PRODUCTS

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Flowers of Sulphur 99½% Pure (30% Insoluble Sulphur)

Stauffer

CHEMICAL COMPANY

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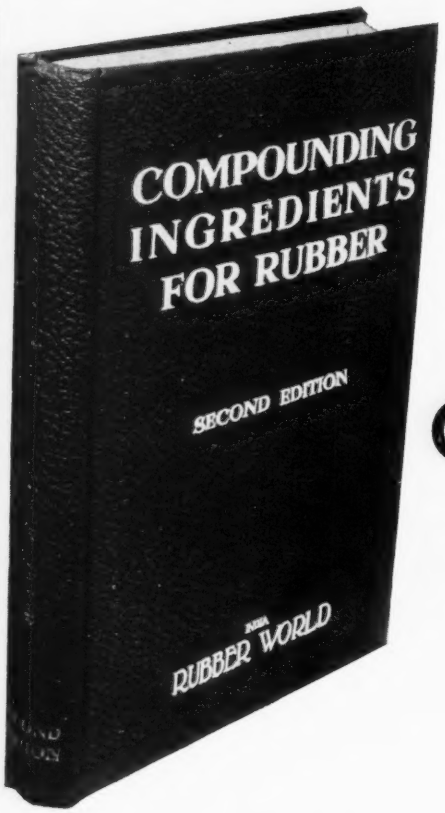

A MUST

FOR EVERY COMPOUNDER

1947 — Second Edition of

COMPOUNDING INGREDIENTS for RUBBER

The new book presents information on nearly 2,000 separate products as compared to less than 500 in the first edition, with regard to their composition, properties, functions, and suppliers, as used in the present-day compounding of natural and synthetic rubbers. There is also included similar information on natural, synthetic, and reclaimed rubbers as the essential basic raw materials. The book consists of over 600 pages, cloth bound for permanence.

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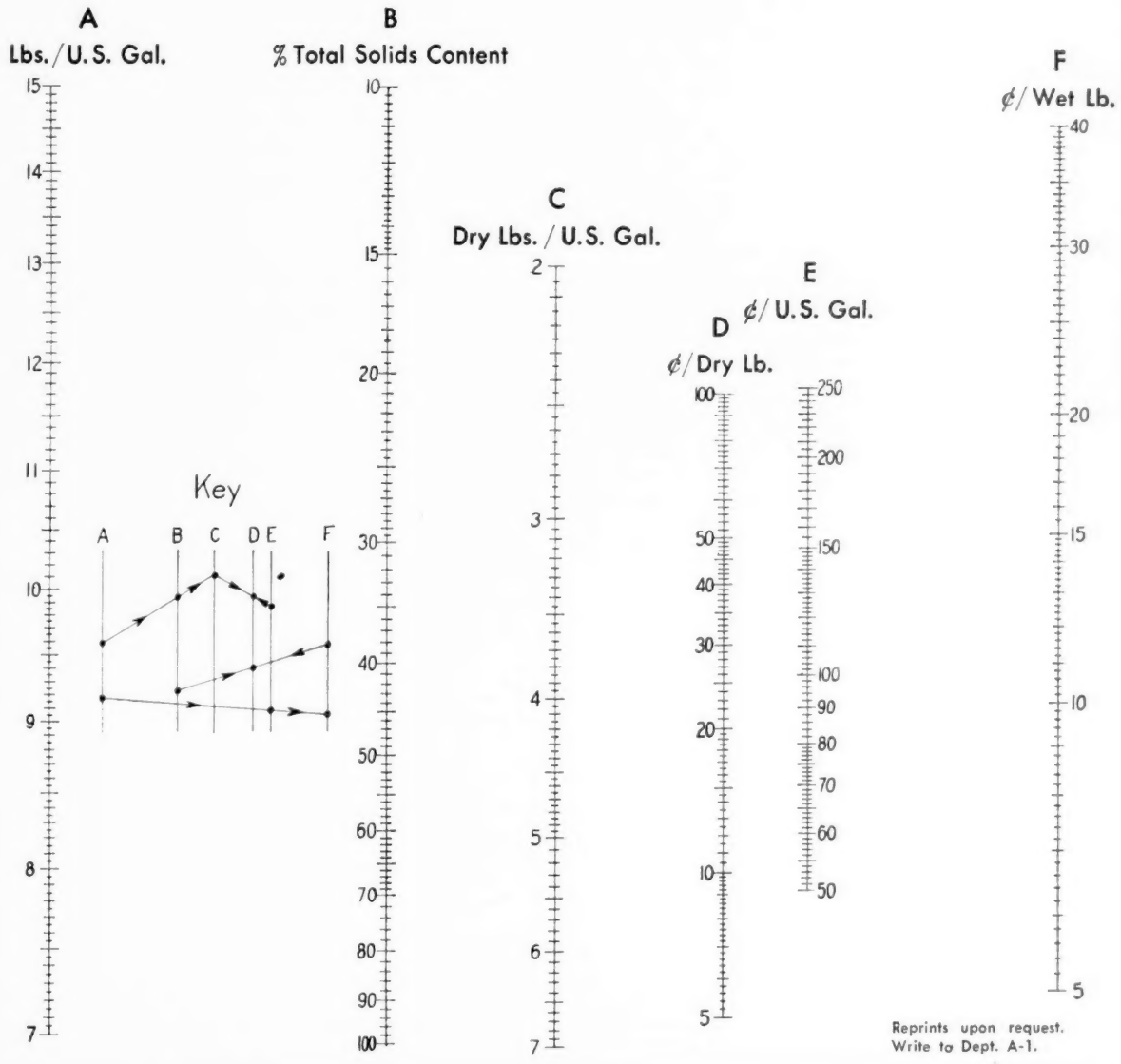
NOMOGRAPH FOR LATEX AND LATEX COMPOUNDS

GENERAL LATEX & CHEMICAL CORPORATION



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Write to Dept. A-1.

GENERAL LATEX & CHEMICAL CORPORATION, CAMBRIDGE, MASS.

Importers and Compounders of Natural and Synthetic Rubber Latex

GENERAL LATEX & CHEMICALS (Canada) LTD.

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Exclusive agency for sale of **Harrisons & Crosfield** Malayan latex in U. S. A.

NOW... G-E 2557 plasticizer available at lower cost

INCREASED VOLUME PERMITS COST REDUCTION OF POPULAR PLASTICIZER

The volume of G-E 2557 plasticizer used by manufacturers of vinyl, rubber, and lacquer products has increased so greatly that savings in production costs have resulted. Therefore, the price to you has been cut to a new low.

To find out what G-E 2557 plasticizer can do for you, write us at Section C5, Chemical Department, General Electric Company, Pittsfield, Mass., or use the coupon below.

Features of G-E 2557 plasticizer proved by test and experience

- Outstanding Permanence
- Unusual Light Stability
- High Heat Resistance
- Low-temperature Flexibility
- Excellent Extrudability
- Preferred Pigment Wetting Characteristics

SEND FOR MORE DETAILS!

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General Electric Company
Pittsfield, Massachusetts

Please send me technical information on G-E 2557 plasticizer.

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Business_____

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You can put your confidence in

GENERAL ELECTRIC

VULCANIZED VEGETABLE OILS

—RUBBER SUBSTITUTES—

Types, grades and blends for every purpose, wherever Vulcanized Vegetable Oils can be used in production of Rubber Goods—be they Synthetic, Natural, or Reclaimed.

A LONG ESTABLISHED AND PROVEN PRODUCT

THE CARTER BELL MFG. CO.
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CARTER BELL PRODUCTS
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NOW! 2 "PROTOX" ZINC OXIDES 166 and 167

FOR FASTER PROCESSING ● FOR HIGHER REINFORCEMENT

Both Protox-166* and Protox-167* bring you all the well-known advantages of American Process Zinc Oxides . . . *plus* these important features:

- Faster, more uniform mixing
- Quicker, smoother tubing and calendering
- Improved tensile and tear resistance
- Higher modulus and resilience

Which Protox should you use? Consider these points:

1. Protox-166 and Protox-167 are essentially identical in processing and reinforcement properties, as indicated in the table below.

2. In Protox-167, dusting is practically eliminated and dispersions are even somewhat improved in comparison with Protox-166.

3. Protox-166 should be continued in use where water suspensions of Zinc Oxide are involved, as Protox-167 is resistant to wetting by water.

WHICH PROTOX DO YOU WANT TO TEST *NOW*?

COMPARISON OF PROTOX-166 AND PROTOX-167 ZINC OXIDES . . .

Identification	Time of Cure (Min. at 20 lb.)	Tensile Strength (Lb./Sq. In.)	Per Cent Elongation	Load (Lb./Sq. In.) for Elongation of 300%	500%	Abrasion Resistance (Feldspar)	Shore Hardness	Tear Resistance	Min. to T-50 at 0°C
Protox-166	10	675	700	120	315		31	25	39
	15	2200	670	440	1160		38	66	
	30	3420	655	660	1980	84	44	231	
	45	3560	635	785	2235	105	48	286	
	60	3600	620	825	2320	113	50	234	
	75	3515	605	850	2380		51	269	
	90	3380	585	855	2400		51	227	
Protox-167	10	1520	690	240	760		34	35	37
	15	2700	680	475	1390		39	87	
	30	3335	635	705	2000	82	45	237	
	45	3460	625	745	2120	101	48	325	
	60	3500	605	810	2300	106	49	306	
	75	3480	600	840	2320		50	308	
	90	3420	600	885	2340		51	270	

		Goodyear-Healey Pendulum			Compression Fatigue (Goodrich Flexometer)*					Cut-Growth Resistance Tested at 70°C.
Identification	Time of Cure (Min. at 20 Lb.)	Indentation in mm.	Per Cent Rebound	Hardness (of Block) Shore Rex	Per Cent Initial Comp.	Running Time and Per Cent Permanent Set	Max. Temp. Rise (°C.)	Dynamic Compression Initial	Final	Inches Failure 90,000 Cyc.
Protox-166	60	9.31	83.4	47 50	20.4	15′-2.9	8.7	5.8	7.1	.65
Protox-167	60	9.25	84.1	48 51	21.1	15′-2.7	8.6	6.3	7.1	.73

FORMULA

Smoked Sheet	100
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MBT	1
Agerite Powder	1
Stearic Acid	3
Zinc Oxide	100

***TEST CONDITIONS:**
Load—93 psi.
Stroke—0.25 inch
Oven Temp.—100°C.

	Williams 3′ Plast.	Plasticity Recovery
Protox-166	2.35	.15
Protox-167	2.40	.17

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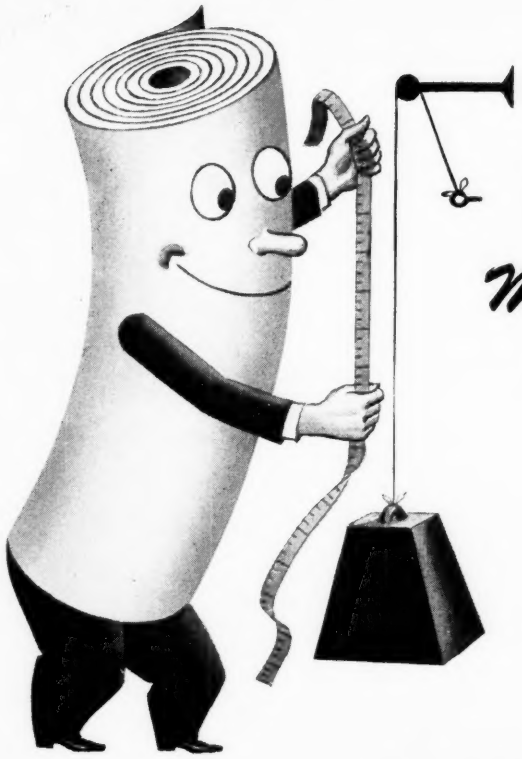

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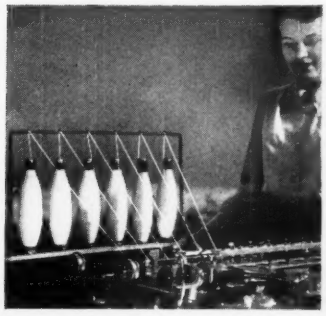

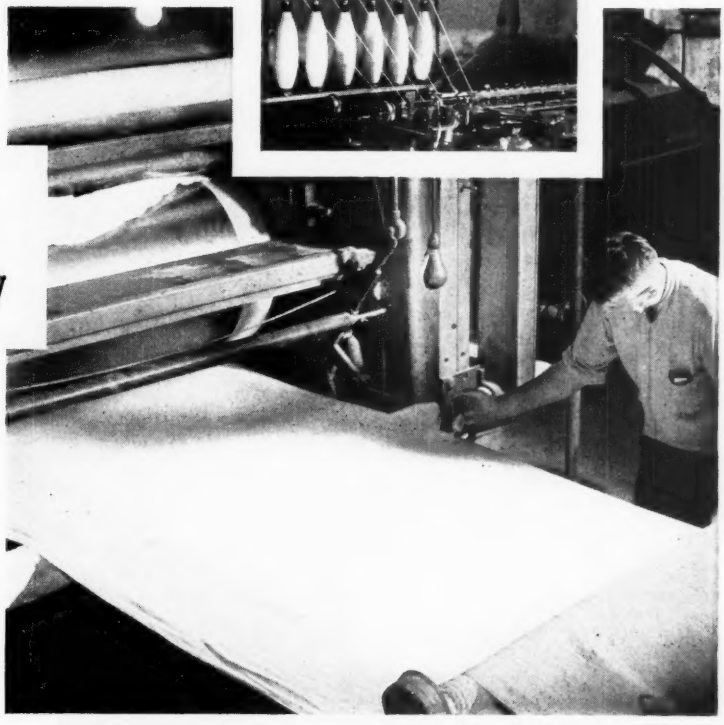

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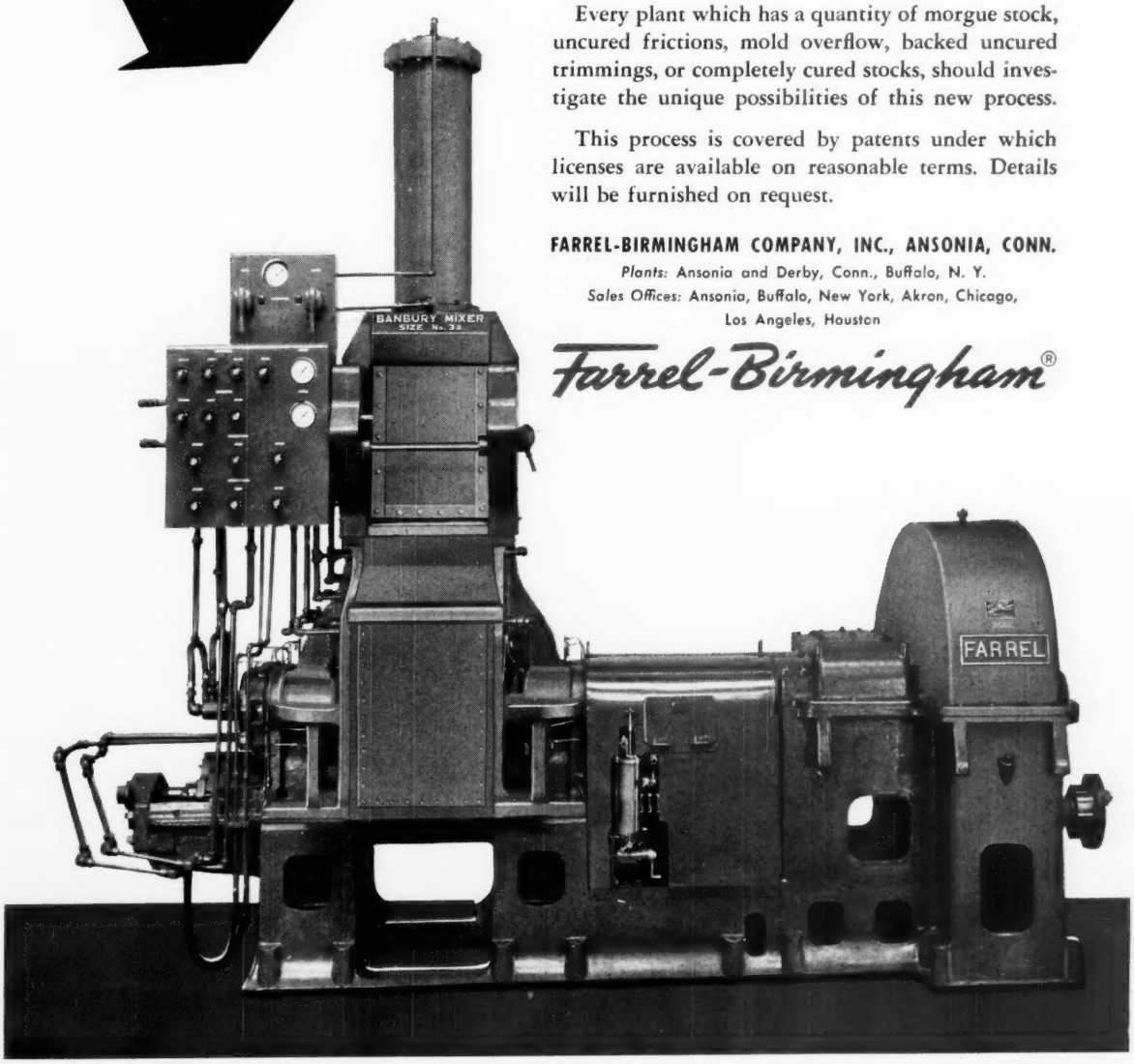

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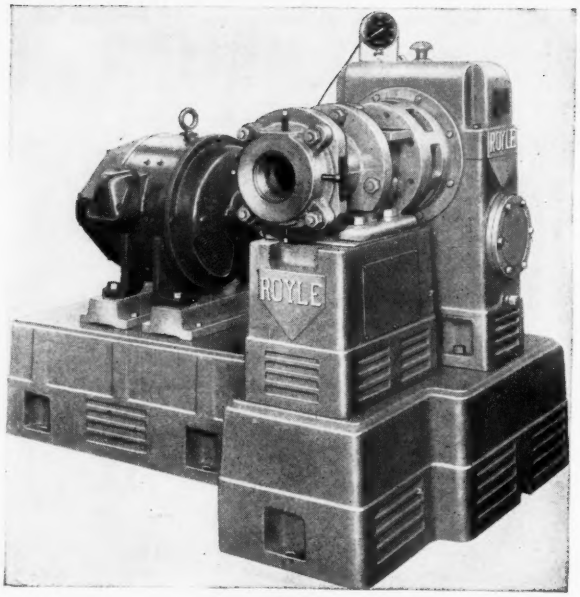

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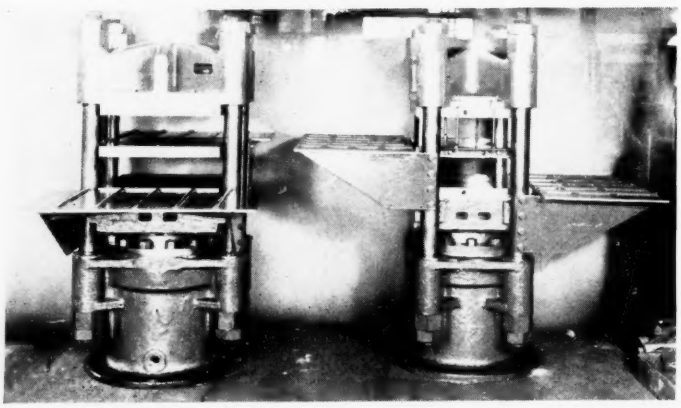

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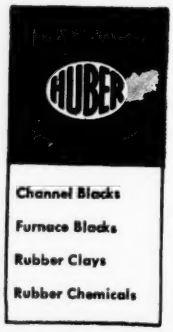

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Volume 122 New York, September, 1950 Number 6

Effect of Mechanical Aggregation on the Dispersion Characteristics of Carbon Black[1]

E. M. Dannenberg,[2] M. E. Jordan,[2] and C. A. Stokes[2]

THE reinforcing properties of carbon blacks in rubber, and their pigmenting properties in paints and inks are closely related to the very small size of their individual particles. Although the importance of particle size is well recognized, the equally important property of dispersion is often neglected. In order to utilize those properties associated with fineness of subdivision, it is obviously necessary to disperse the substance to a degree commensurate with its particle size. The ease with which carbon blacks disperse in rubber and other media contributes greatly to their unique reinforcing and pigmenting characteristics.

Many factors influence dispersion. As the particle size of a pigment is decreased, it becomes more difficult to disperse the pigment in any medium. This difficulty is due to the higher energy required to develop the greater amount of interfacial surface and also to the increased coherence of the aggregates composed of the smaller particle-size material. The particles of any finely divided material tend to form agglomerates. This condition has been observed, when using both the optical and electron microscopes, for particles of widely varying chemical composition. The tendency for agglomerate formation seems to increase as the particle size decreases. Other factors which influence dispersion are the chemical composition of the particle surface, the chemical and physical properties of the dispersion medium, and the use of dispersing aids.

This investigation is concerned with the influence of mechanical aggregation of carbon blacks on dispersion in a number of different media. The aggregation of carbon blacks takes place at all stages of manufacture. Carbon black particles, when first formed in the flame, associate into aggregates of such great strength that this phenomenon has been designated as the formation of carbon "structure." Carbon "structure" will persist in finished rubber stocks even after prolonged milling and is, for many purposes, a desirable property. The "structure" of carbon blacks can be designated as a type of primary aggregation. These primary aggregates of carbon formed in the flame are further aggregated to a weaker secondary type of aggregates during manufacture by Cottrell precipitators, Cyclone collectors, and mechanical conveyers.

In its initial state after collection carbon black is a fluffy material having a bulk density of only three pounds per cubic foot. In such a state it presents major handling and shipping difficulties so that further bulk densification is required to make the finished product ready for more convenient use by the rubber industry. The mechanical tumbling and churning of fluffy carbon black eliminates a large part of the occluded air and makes a product having a beaded form with a bulk density of more than 20 pounds per cubic foot. This process of going from the initial light fluffy state of low bulk density to the heavier highly densified state of high bulk density has been termed mechanical aggregation. This term defines a relatively weak secondary type of aggregation, in contrast to the more permanent primary or "structure" type of aggregation formed during the combustion process.

In most of the major rubber uses of carbon black the influence of mechanical aggregation or bulk density is small, particularly since the ordinary commercial variations of this property cover a relatively narrow range for each of the various grades of black. The manufacturers of carbon black densify their products to the optimum degree consistent with the requirements of good dispersion in rubber and satisfactory bulk handling properties in automatic conveyer systems. It is well recognized that the degree of densification of rubber carbon black grades is not desirable for ink and paint applications employing normal mixing techniques. For such applications lower bulk density, fluffier products have been preferred. Recent studies by Dannenberg and Seltzer (1)[3] have shown that the dispersion of carbon black in water is influenced by the degree of mechanical aggregation of the dry black. It appears that in low-viscosity fluid media, such as water and oil vehicles, the degree of mechanical aggregation has a significant influence on the dispersion

[1] Presented before the Division of Rubber Chemistry, C.I.C., Toronto, Ont., Canada, June 21, 1950.
[2] Godfrey L. Cabot, Inc., Boston, Mass.
[3] Numbers in parentheses refer to Bibliography items at end of this article.

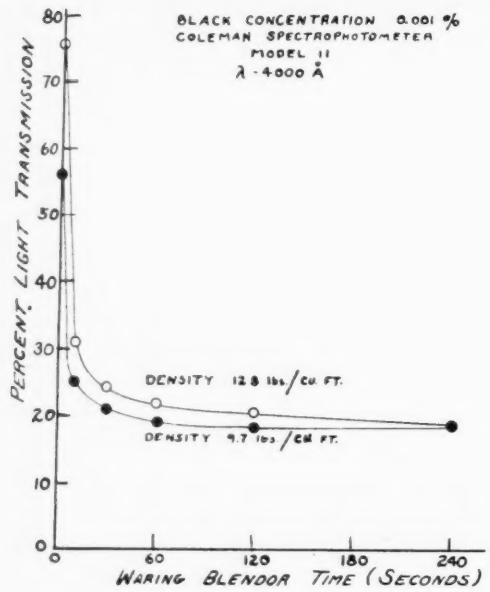


Fig. 1

of carbon black. On the other hand this effect is almost negligible in high-viscosity elastic media such as natural rubber and most types of synthetic rubber. Between these extremes are many resinous and elastomeric materials in which the influence of the extent of dry aggregation of carbon black can be observed. This paper presents information on this phenomenon for a number of different carbon black loaded materials including water, news ink vehicle, natural rubber, "cold" GR-S, Butyl rubber, nitrile rubber, and polyethylene.

Influence of Mechanical Aggregation of an HAF Black (Vulcan 3) on Dispersibility in Water

Studies of the aqueous dispersion characteristics of carbon blacks have recently become of interest in connection with the manufacture of carbon black-synthetic rubber masterbatches. The development and production of black masterbatches has been described by Rongone, Frost, and Swart (2), Madigan and Adams (3), and Adams, Messer, and Howland (4). The sequence of operations in making black masterbatch is carefully controlled mixing of an aqueous dispersion of carbon black and synthetic rubber latex, followed by creaming, coagulation, washing, drying, and baling. The relation between the chemical and the physical properties of the carbon blacks and the properties of the aqueous dispersions has been investigated by Dannenberg and Seltzer (1).

Aqueous dispersions of carbon black for latex incorporation are prepared by grinding the pelletized carbon black in a micropulverizer prior to its addition to the solution of dispersing agent in water. This process produces a much lighter, lower bulk density material from the beaded or pelletized material. The micropulverized black, however, still contains many aggregates formed during the pelletizing process. This condition is indicated by the fact that the bulk density after micropulverization is related to the initial density before grinding shown in Table 1.

In order to demonstrate the influence of the degree of mechanical aggregation on the dispersibility in water a series of samples of HAF black (Vulcan 3) having bulk densities[4] of 12.4, 17.7, and 30.2 pounds per cubic foot was used. These samples were made up into 15% dispersions with the aid of 4% dispersing agent,[5] using relatively mild agitation. Light transmission measurements of these suspensions after dilution to 0.001% black concentration were used to demonstrate the differences in degree of dispersion. A system containing coarse aggregates transmits more light than a system containing smaller aggregates. Table 1 shows that increasing the density or degree of mechanical aggregation of the dry black results in poorer dispersions containing a greater number of coarse aggregates.

TABLE 1

HAF Black (Vulcan 3)	Bulk Density (# Cu. Ft.) Original	After Micropulverizing	% Light Transmission
Very low density	12.4	9.7	55.6
Low density	17.7	10.0	61.0
Normal density	30.2	12.8	75.9

The relation between bulk density and the dispersion in water suggests that the carbon aggregates present in the dry black are not substantially disintegrated during the above process of preparing the aqueous carbon suspension. In this case the dispersing agent's major function is to keep the suspension fluid. The dispersing agent does not disperse or disintegrate the aggregates initially formed in the dry black.

These dispersions are extremely sensitive to further agitation or mechanical shear. If the original 15% suspensions are mixed in a Waring Blendor, which can develop relatively high-speed mixing conditions, considerable dispersion occurs in a very short time, and the differences due to dry aggregation are completely eliminated after four minutes' mixing time, as shown in Figure 1 for the high and low density samples. This demonstrates that high mechanical shearing conditions are necessary to disintegrate the carbon aggregates, and the dispersing agent's function is to prevent flocculation of the new and smaller aggregates which are formed. The stabilizing action of the dispersing agent takes place by molecular adsorption and the consequent development of negative repulsive charges on the carbon aggregates.

Influence of Dry Density of a Channel-Grade Ink Black (Elf 5) on the Rheological Properties of News Ink

The rheological properties of carbon black-oil systems are particularly sensitive to the degree of dry densifica-

[4] A 100-ml. cylindrical graduate is weighed and then loosely filled with black, and the weight of the black determined by difference. The graduate is gently tapped on a wooden bench whose surface is covered with a ⅛-inch thick square of rubber. Tapping is continued until a constant volume of black is obtained (3-5 minutes). The density is calculated from the final volume and known weight of sample and is expressed as pounds per cubic foot.

[5] Marasperse CB—Marathon Corp., Rothschild, Wis.

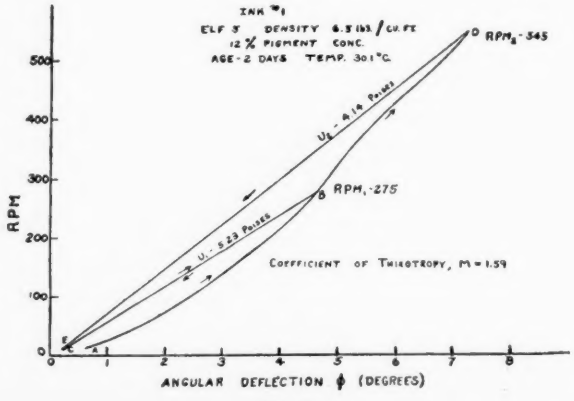


Fig. 2

tion of the carbon black. Carbon blacks which are highly densified result in systems of low viscosity and thixotropy.

A study of the effect of dry density on the rheological properties of a news ink was made using Elf 5, a typical news ink black made by the channel process. Black samples were prepared having dry densities of 6.5, 15.0, 22.0 and 36 lbs./cu.ft. and incorporated into a news ink vehicle[6] at 12% black concentration by ball-milling for two hours. After aging for two days at room temperature, the rheological properties of the inks were measured with a Sun Chemical Corp. rotational viscometer (5) at a temperature of 30.1° C. Two complete hysteresis cycles were measured. In all cases the speed of the viscometer was increased from 11.5 rpm. to 275 rpm. and then decreased to 11.5 rpm. The speed was again increased from 11.5 rpm. to 545 rpm. and decreased to 11.5 rpm. Continuous readings were made as the speed was increased or decreased in units of three rpm. per second so that the time interval between each speed was five seconds. The angular deflection of the viscometer wire was measured by the deflection of a light beam on a small mirror attached to the wire. A plot of the data obtained with the ink prepared from the 6.5 lbs./cu.ft. density black sample is shown in Figure 2.

The sequence of operations consists in going up to 275 rpm. on the line AB, decreasing speed to 11.5 rpm. on line BC, increasing speed to 545 rpm. on line CBD, and decreasing speed to 11.5 rpm. on line DE. It can be seen from this diagram that thixotropic behavior occurs as evidenced from the pronounced hysteresis in going through a complete cycle from a low speed to a higher speed and back again. The slope of the straight lines observed in going from the high speeds to the starting speeds, lines BC and DE, are inversely proportional to the viscosities of the ink. These apparent viscosities, U_1 and U_2, are thus a function of the shear history of the sample. The two hysteresis loops, ABC and ABDE, shown in Figure 2 are necessary in order to calculate the coefficient of thixotropy, M, as described by Green (6).

$$M = \frac{2\ (U_1 - U_2)}{\ln \left\{\left(\frac{RPM_2}{RPM_1}\right)^2\right\}} \qquad \begin{matrix} RPM_2 = 545 \\ RPM_1 = 275 \end{matrix}$$

This coefficient of thixotropy is related to the difference in apparent viscosities determined at the two respective top rates of shear. It is obvious that this coefficient will be equal to zero for the case where no hysteresis occurs.

Figure 3 shows the same type of rheological diagram for the highest dry density black of 36 lbs./cu.ft. The higher slopes of U_1 and U_2 indicate lower apparent viscosities than was observed in Figure 2 for 6.5 lbs./cu.ft. density black. The areas enclosed by the two loops indicate a lower degree of thixotropy. Complete data for the entire series of Elf 5 samples varying in degree of dry densification is shown in Table 2.

TABLE 2. RHEOLOGICAL PROPERTIES OF NEWS INKS

Ink No.	Tapped Density of Black (#/Ft.³)	Viscosity, Poises		M Coefficient of Thixotropy
		U_2	U_1	
1	6.5	4.14	5.23	1.59
2	15.0	3.38	4.16	1.15
3	22.0	3.22	3.91	1.01
4	36.0	2.40	2.78	0.55

The formation of carbon flocculates in these news ink systems is undoubtedly responsible for their thixotropic properties and the dependence of their apparent viscosities on their shear histories.

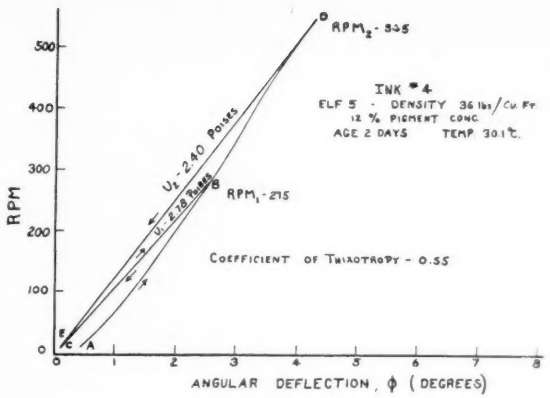


Fig. 3

The variations in thixotropic behavior and apparent viscosities for the news inks are due to dispersion differences. As the bulk density of the black is increased, the dispersion becomes characterized by the presence of relatively large agglomerates whose surface attractive forces are small relative to the mass of the agglomerates. The attractive forces are not strong enough to counteract the influence of Brownian motion and sedimentation and cause the formation of stable flocculates from these large agglomerates. Thus the rheological behavior of these dispersions approaches the behavior of dispersions prepared from coarser particle-size pigments, and lower apparent viscosities and thixotropy are observed. The dispersion of carbon blacks in oil may be characterized by the presence of large agglomerates at one extreme; by an intermediate stage where the agglomerates are disintegrated, and the carbon black is present as flocculates held together by weak, shear-sensitive, attractive forces; and at the other extreme, an ideal dispersion where all the flocculates are destroyed, and each particle of carbon black is separated from every other particle by a film of oil. If one considers the properties of the dispersion at all these stages, it is fairly obvious that the apparent viscosity of the poor dispersion will be low, the flocculated dispersion will be high in viscosity, and the ideal dispersion viscosity will be lower than the flocculated dispersion viscosity. Similar to the viscosity which is seen to go through a maximum in these stages, the thixotropic properties also go through a maximum. The poor dispersion is more Newtonian in rheological behavior than is the flocculated dispersion, and the ideal dispersion is also more Newtonian than the latter. It should be mentioned that the ideal dispersion stage is approached by destroying the carbon flocculates through the use of mechanical shear and in some cases by adding dispersing and stabilizing agents. As will be demonstrated later in this paper, differences in the types of dispersions of carbon blacks in rubbers cause many of the rubber properties to follow a similar pattern.

It has been pointed out by Mullins (7) that the rheological properties of mixtures of carbon black and oil or water are completely analogous to the rheological behavior of carbon-black loaded rubber stocks (7). Thus Mullins has shown that the modulus of a cured rubber stock at a given elongation depends on the degree of previous elongation which the rubber stock has experienced (18). This point is shown in Figure 4.[7]

The solid line represented the original stress-strain curve for the MPC loaded natural rubber tread stock. If a test specimen is stretched to 280% elongation along the

[6] Mineral oil plus 1% Gilsonite—1.38 poises.
[7] *J. Rubber Research*, 16, 275 (1947).

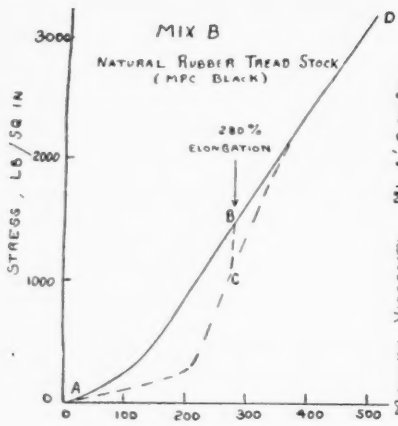


Fig. 4

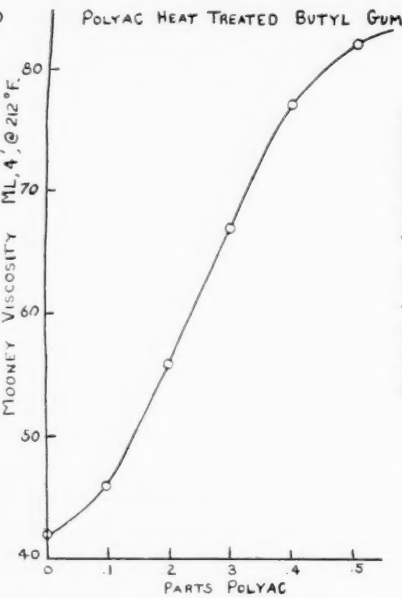


Fig. 5

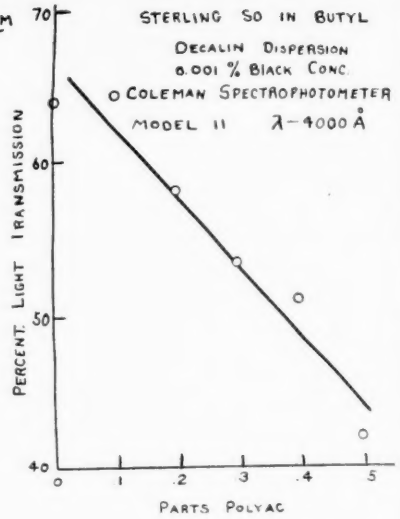


Fig. 6

line AB and held at this elongation for five minutes, stress relaxation occurs, shown by the dotted line BC. If allowed to retract, the stress-strain curve will follow dotted line CA. If the same specimen is now stretched to its breaking elongation, the stress-strain curve will follow line AC below the 280% elongation of the previous stretching, and beyond this point the line CD, which is essentially the same as the original stress-strain line BD. This phenomenon is assumed to result from the presence of carbon flocculates held together by bonds of varying strength. Stretching to low elongations destroys a portion of these bonds, and at higher elongations more bonds of greater strength are destroyed. It follows that in initial stretching the stress at any given elongation is controlled by carbon-carbon bonds which can be destroyed only at higher elongations.

In the same way, the apparent viscosity of a news ink depends upon the extent of structure breakdown brought about by previous shearing history. In rubber, the stress-strain diagram is almost unaffected at elongations above the elongation of previous stretching. Figures 2 and 3 show the same behavior in news inks, since the torque *versus* rate of shear line is not influenced at rates of shear higher than the previous lower rate of shear. For example, in Figure 2 carbon structure is broken down as the rate of shear is increased to 545 rpm. along the line ABD. If the sample is first taken up to a rate of shear of 275 rpm. along the line AB and the rate of shear decreased, the straight line BC is obtained, indicating the complete breakdown of that portion of the carbon-carbon bonds in the flocculates sensitive to rates of shear corresponding to the maximum value of 275 rpm. If the rate of shear is increased again, the line CB is obtained up to 275 rpm., and above this rate of shear the curve BD is followed, as if no previous shearing history had occurred.

The effects of previous shear history in the case of carbon black-oil systems and the effects of previous elongation on the stress-strain curve of rubber stocks are temporary, and the initial properties recover slowly on aging. The aging process is accelerated by increasing temperature. In describing this phenomenon for rubber Mr. Mullins (8) has proposed the following simile:

"Stretching the rubber can be compared to taking a cross-country tramp along an overgrown track, progress will only be easy in parts which have recently been used and where the undergrowth is broken down."

It might be added that given time and sun, the undergrowth will be back in its upright position.

Influence of Bulk Density of an MPC Channel Black on the Properties of Natural Rubber and GR-S X-478 Tread Stocks

The effect of different bulk densities of a medium processing grade of channel black on the properties of natural rubber and GR-S, X-478 tread stocks was found to be almost insignificant for the range of densities consisting of 8.9, 15.7, 21.7, and 28.7 lbs./ cu. ft. These four samples of MPC grade black were compounded in the typical tread recipes shown in Table 3.

TABLE 3

Natural Rubber		GR-S X-478	
Smoked sheets	100	GR-S X-478	100
MPC black	50	MPC black	50
Zinc Oxide	5	Zinc oxide	3
Sulfur	2.8	Sulfur	1.75
MBT	0.9	Santocure	1.25
Antioxidant	1	Stearic acid	1.5
Stearic acid	3	Antioxidant	1
Pine tar	3	Para Flux	5
		Circosol 2XH	3
Cure 60' @ 280°F.		Cure 60' @ 292°F.	

A summary of the rubber data is given in Table 4.

TABLE 4. EFFECT OF BULK DENSITY ON RUBBER PROPERTIES

Bulk Density	300% Modulus	Tensile	% Elongation	Electrical Resistance (Megohm-Cm.)	Rebound* % Restored Energy	Angle Abrasion† (Volume Index)
MPC Black in Natural Rubber Tread Recipe						
8.9	1610	4710	580	0.53	64.8	289
15.7	1490	4720	600	0.82	66.2	316
21.7	1520	4690	590	1.2	67.5	296
28.7	1520	4550	570	1.4	67.7	359
MPC in GR-S X-478 Tread Recipe						
8.9	950	4200	660	19.6	56.9	157
15.7	1040	4120	680	26.2	56.5	159
21.7	1000	4150	660	22.0	56.7	163
28.7	880	3630	640	82.0	57.5	239

*Goodyear-Healy pendulum rebound apparatus. Tested at 73° F.
†Akron Standard Mold abrader. Angle 15 degrees. Volume index represents c.c. loss/10^6 revolutions.

Table 4 shows that stress-strain properties are not affected in this range of dry densities. As the bulk density is increased, the electrical resistivity increases, rebound increases, and abrasion loss shows trend toward increasing. These effects are very small, but do illustrate

that the degree of dry mechanical aggregation can be detected even in these tread stocks. The observed trends in electrical resistivity and rebound require some explanation since they are not in agreement with previous work published by Dannenberg and Collyer (9) who reported an increase in electrical resistance, and an improvement in rebound and abrasion resistance due to the better dispersion obtained by high-speed, high-temperature Banbury mixing.

The increase in resistivity and rebound observed with increasing degree of dry mechanical aggregation, shown in Table 4, is attributed to relatively poor dispersion. It is felt that a change in dispersion can give rise to a change in rebound and electrical resistivity properties in either direction, depending upon the type of dispersion involved. A stock characterized by most of the black being in a state of submicroscopic dispersion and a small portion of the black being present as large aggregates in which the black is not wetted by the rubber phase will have rubber properties similar to a stock containing a lower loading of black. The properties most sensitive to this situation, resistivity, rebound, and abrasion loss, would be higher in this case. This type of dispersion is felt to prevail where the degree of dry mechanical aggregation of the black has an influence on rubber properties. Although the data obtained in this study show almost negligible differences among the samples of different bulk densities, the fact that consistent trends in resistivity and rebound were obtained indicates that this type of dispersion phenomenon is present to a slight degree.

It seems anamolous that improved dispersion can also result in the same effect as bad dispersion on rebound and resistivity, but have the opposite effect on abrasion loss. In this case, however, all the carbon black is wetted by the rubber phase and is present in a state of relatively good dispersion. Further improvements in dispersion beyond this stage result in the disintegration of carbon black flocculates resulting in a more rubbery product having higher rebound and electrical resistivity properties.

A better understanding of the dependence of such properties as rebound, electrical resistivity, and abrasion on the degree of carbon black dispersion can be obtained if one considers the properties of a vulcanizate prepared from a stock where the amount of mixing has been just enough to incorporate the black, but insufficient to affect any dispersion of the coarse aggregates. Such a vulcanizate, consisting of a continuous and essentially unloaded rubber phase in which are embedded very large carbon aggregates, will have properties similar to a vulcanizate containing a very coarse non-reinforcing filler, the rebound, electrical resistivity, and abrasion loss will be relatively high.

In actual practice, with commercial grades of black it is almost impossible to obtain this extreme condition of poor dispersion because during mixing both processes of dispersion and incorporation take place at the same time. The rate of dispersion, however, can be seriously decreased by a high degree of black densification and aggregation so that this condition can be approached under these circumstances. Excessive dry densification can be obtained by ball-milling carbon black, and studies in rubber of black treated in this manner show pronounced deterioration of rubber reinforcing properties. Improving the carbon black dispersion will result in a decrease in rebound and electrical resistivity because of the formation of a loose network of carbon flocculates which tends to reduce the resilience and increase the probability of the through going carbon chains necessary for electrical conductivity (10). At the same time the abrasion loss is decreased because of the improved dispersion and the development of carbon surface-rubber interface. Further dispersion of the carbon flocculates breaks up the through going chains and increases the electrical resistivity and rebound. This discussion suggests that the electrical resistivity and rebound go through minimum values, and the abrasion loss decreases as the degree of dispersion of the carbon black is improved. In the case of the news ink dispersions described earlier in this paper it was seen that the rheological properties, such as viscosity and thixotropy, must go through maximum values as the dispersion is improved.

Study on the Effect of Bulk Density of an HAF Black on the Properties of Natural and GR-S X-478 Tread Stocks

In contrast to the slight effect found with the channel-black densification series just described, the rubber properties of tread stocks prepared from different bulk density samples of HAF black showed no differences. The recipes and cures used in this study were the same as in Table 3 except that the accelerator loading was reduced to 0.5-part MBT in the natural rubber tread recipe, and one part of Santocure in the GR-S X-478 tread recipe.

With this type of black the shearing forces developed in both "cold rubber" (GR-S) and natural rubber are capable of eliminating the effects of dry mechanical aggregation. It should not be inferred from these data, however, that an ultimate dispersion of the HAF black, where each particle is separated from every other particle by a film of rubber, has been obtained.

Since the range of HAF bulk densities used in this investigation are the same as for the channel black series, and the HAF series showed no differences in rubber properties, whereas the channel black series showed slight differences, it must be inferred that the channel black pellets or aggregates are stronger and more difficult to disperse than HAF pellets. This point is not surprising when one considers that channel blacks as a group offer less resistance to densification and can be more easily formed into strong pellets of good bulk handling properties than is the case with HAF blacks. The reasons for this behavior of channel blacks, compared to furnace blacks, is probably associated with differences in primary structure and the chemical composition of their surfaces. The high degree of primary structure of the HAF blacks causes a mechanical difficulty in packing the primary aggregates into a higher density arrangement. The HAF blacks, compared to channel blacks, require more energy

TABLE 5. EFFECT OF BULK DENSITY ON RUBBER PROPERTIES

Tap Density	300% Modulus	Tensile	% Elongation	Shore A2 Hardness	Electrical Resistance (Megohm-Cm.)	Rebound % Restored Energy	Angle Abrasion (Volume Index)
			Vulcan 3 in GR-S X-478				
11.9 fluffy black	1620	4020	570	68	0.012	60.7	113
17.3	1640	4020	560	69	0.014	61.0	117
30.1	1690	3790	540	69	0.032	60.7	111
			Vulcan 3 in Natural Rubber				
11.9	1700	3770	510	68	0.0016	72.7	185
17.3	1770	3920	520	69	0.0016	73.0	186
30.1	1820	3840	510	68	0.0016	73.0	185

and time to pack to the same density. At the same density the channel blacks adhere more strongly and disperse with greater difficulty than the HAF blacks, probably as a result of differences in the chemical nature of their surfaces. Work of Dannenberg and Collyer (9) on the high-speed, high-temperature mixing of carbon blacks in low-temperature GR-S are in agreement with this explanation. These authors have stated that the superior performance of HAF blacks, compared to channel blacks, is attributable in part to the fact that HAF blacks are easier to disperse.

It is of interest to mention the very large differences between the electrical resistivity values of natural rubber and GR-S X-478 obtained with both the channel and the HAF black series. Natural rubber tread stocks are more conductive than synthetic rubber tread stocks, indicating that they possess a greater degree of carbon flocculation. That this phenomenon is a general one observed with many different types of carbon black is shown in Table 6. Data showing the same phenomenon have been reported by Sperberg, Popp, and Biard (11).

TABLE 6. ELECTRICAL RESISTIVITY OF NATURAL RUBBER AND STANDARD GR-S VULCANIZATES CONTAINING 50 PARTS OF VARIOUS CARBON BLACKS

		Megohm-Cm.	
Trade Name	Type	Standard GR-S	Natural Rubber
Shawinigan	Acetylene	0.04	0.001
Sterling SO	Oil-HMF	980	0.029
Vulcan 3	HAF	0.83	0.002
Philblack 0	HAF	0.28	0.023
Spheron 6	MPC	40	0.58

Deflocculation of the carbon black in natural rubber tread stocks offers a definite possibility of getting improved road wearing properties. This achievement has been accomplished by the well-known heat treatment process of Gerke, Ganzhorn, Howland, and Smallwood (12). Another possibility of obtaining a similar result would depend upon maintaining a high viscosity and elastic medium during the processing of natural rubber by inhibiting oxidative breakdown.

Dispersion Studies in Butyl Rubber (GR-I 15)

The effect of varying the dry bulk density of an oil-type furnace black (Sterling SO) resulted in no significant changes in properties, when compounded at 50-part loading in Butyl rubber. This point indicates that the shearing forces developed in this medium are sufficient to destroy the mechanical aggregation of the loose black and result in good dispersion.

The viscosity and elastic characteristics of Butyl rubber can be modified by prior heat treatment of the gum rubber in the presence of a cross-linking agent. This treatment offers the interesting possibility of studying the effect of such changes on the dispersion of carbon black in Butyl rubber.

For this work Butyl rubber (GR-I 15) was heat treated in a laboratory Banbury mixer with varying amounts of Polyac[8] a Butyl cross-linking agent (13), for five minutes at 300-330° F. The change in Mooney viscosity as a function of the amount of Polyac used is shown in Figure 5.

Samples of Polyac heat treated Butyl rubber were used to prepare stocks according to the recipe in Table 7.

[8] Active ingredient, p-dinitrosobenzene—E. I. du Pont de Nemours & Co., Inc., Wilmington, Del.

TABLE 7

Heat treated Butyl rubber	100
Sterling SO Black	50
Zinc oxide	5
Sulfur	2
MBT	0.5
TMTDS	0.75
Stearic acid	0.5
Petrolatum	1
Paraffin	1

Cure 20' @ 300° F.

The carbon black used in this study was Sterling SO, an oil-type HMF grade, having a normal dry bulk density for a commercial grade of rubber black. The data obtained are shown in Table 8.

These data reflect both the effects of increased dispersion of the carbon black and the increased degree of cross-linking produced by the use of Polyac. It is difficult to assess the relative importance of these effects on the stress-strain characteristics of these stocks, but the almost 100-fold change in electrical resistivity values indicates that improved carbon black dispersion has resulted from cross-linking the raw Butyl by the Polyac heat treatment. A more direct indication of dispersion differences can be obtained by dissolving the uncured stocks in an effective solvent such as decalin, diluting to 0.001% black content, and measuring the light transmission properties in a photometer. This technique is the same as was used earlier in this paper for judging the relative dispersion of carbon black suspensions in water. Figure 6 shows the light transmission properties obtained by this procedure for the series of Polyac heat treated Sterling SO stocks.

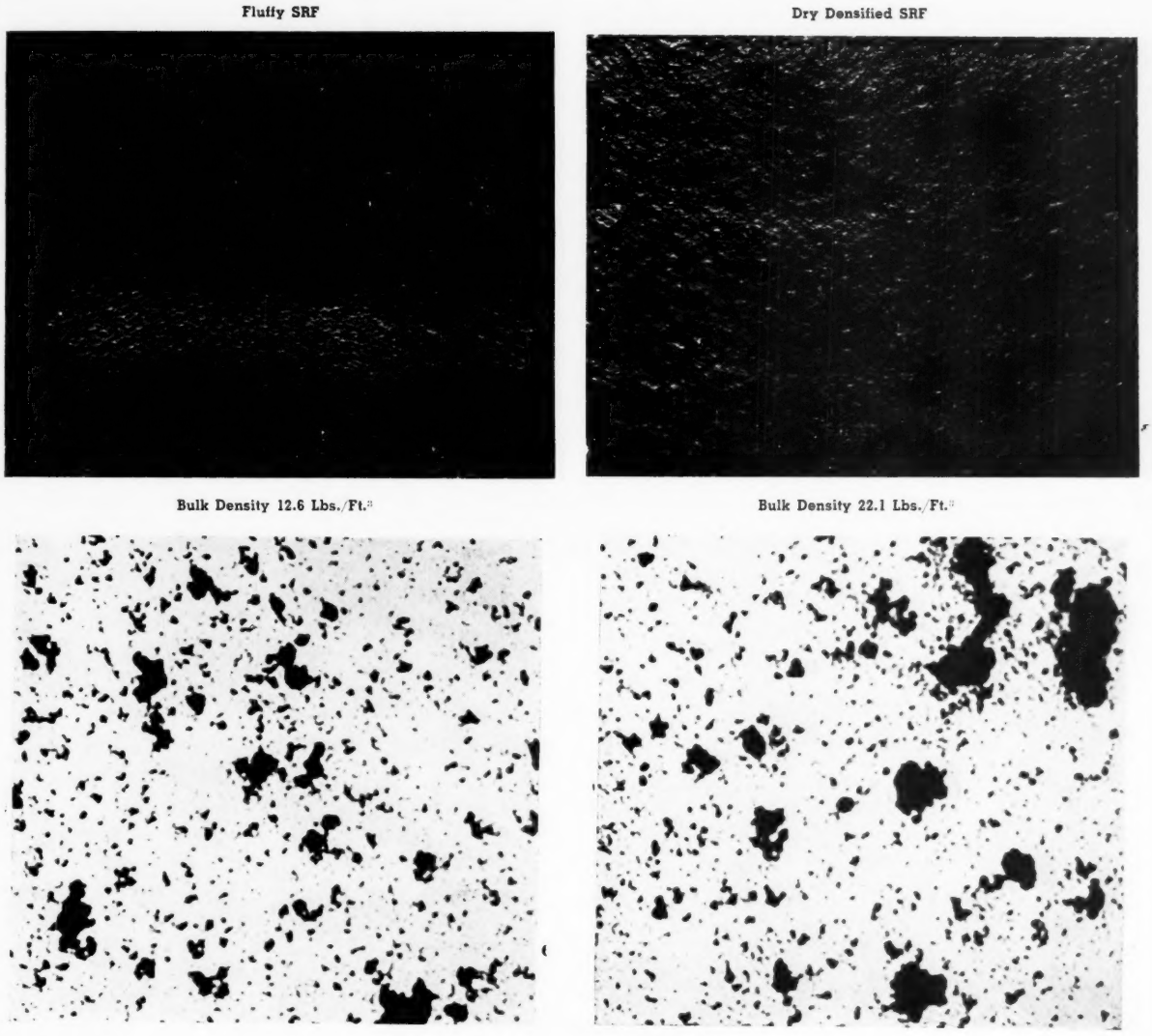
These light transmission data indicate improved carbon black dispersion with increasing quantities of Polyac used in the heat treatment. Figure 5 and Table 8 show consistent increases in Mooney viscosity of the gum and the compounded Butyl stocks with increasing quantities of Polyac. These data might be taken to indicate that viscosity is the property influencing the degree of dispersion. This conclusion was approached with caution since the appearance and properties of the raw Butyl stocks after Polyac heat treatment showed vast differences in nerve and elastic recovery. The question naturally arose as to whether this elastic property, which is distinct from the property of simple viscosity, was a factor in carbon black dispersion. It is entirely conceivable that the shearing and disintegrating force developed by the elastic recovery and swelling of the stock, as it passes through the rolls, exerts a pronounced dispersing action.

To prove whether viscosity or nerve was responsible for the improved carbon black dispersion obtained with Polyac heat treated Butyl a higher Mooney Butyl rubber, GR-I 17 having a Mooney value of 55,[9] compared to GR-I 15 having a Mooney value of 42,[9] was compounded in the same recipe as above with 50 parts of Sterling SO. The compounded stock had a Mooney of 82, which is the same value as was obtained for the GR-I 15 stock heat treated with 0.5-part of Polyac. If these two stocks were characterized by the same degree of carbon black dispersion, then the electrical resistivity and the light transmission measurements on the dilute solvent dispersions should have been comparable. The actual data obtained is shown in Table 9.

[9] After 5-minute premastication at 300-330° F. in laboratory Banbury.

TABLE 8. EFFECT OF POLYAC ON RUBBER PROPERTIES OF STERLING SO STOCKS

Parts Polyac	300% Modulus	Tensile	% Elongation	Shore A2 Hardness	Electrical Resistance	Torsional Hystereses @ 100° C.	Rebound % Restored Energy	Compounded Mooney Viscosity —ML, 4' @212° F.
0	780	1900	630	65	0.006	0.337	35.3	67
0.1	930	1880	580	65	0.006	0.242	36.1	67
0.2	1070	1980	560	64	0.036	0.200	36.8	70
0.3	1250	2100	500	64	0.171	0.174	36.9	75
0.4	1440	2160	460	64	0.308	0.167	37.8	78
0.5	1540	2160	430	65	0.540	0.155	38.5	81



Films from Solvent Dispersion (200 X Mag.)

Fig. 7. SRF in Nitrile Rubber (110-Part Loading)

TABLE 9. PROPERTIES OF BUTYL STOCKS* CONTAINING 50 PARTS STERLING SO

	GR-I 17	GR-I 15	GR-I 15
Parts Polyac	none	0.5	none
Gum Mooney—ML, 4' @ 212° F.	57	82	42
Compounded Mooney—ML, 4' @ 212° F.	82	81	67
Electrical resistivity (megohm-cm.)	0.006	1.8	0.005
% Light transmission	67	42	64

*For reasons of consistency all gum Butyl stocks were subjected to the same Banbury heat treatment regardless of whether Polyac was added.

Both the resistivity and light transmission measurements show that the degree of carbon black dispersion for the GR-I 17 stock containing no Polyac and the GR-I 15 stock heat treated with 0.5 Polyac are quite different although these stocks have the same compounded Mooney values. Increasing the Mooney value of the gum from 42 in the case of GR-I 15 to 57 for the GR-I 17 and using no Polyac has not influenced the dispersion dependent properties. It seems quite likely, therefore, that viscosity changes cannot be used as an explanation for dispersion differences, and that the nerve and elastic recovery properties of the gum rubber are mainly responsible for the observed dispersion differences.

It is of practical importance to recognize the influence of the elastic properties during processing as it may have a pronounced influence on the dispersion of carbon black. Many of the observations published by Morris and Hollister (14) on the effects of added stearic acid and paraffin on the dispersion of carbon black in Butyl rubber can be attributed to slightly poorer dispersion arising from the lowering of nerve and stock viscosity when these softeners were added.

Studies on the Dispersion of SRF Black in Nitrile Rubber

The previous studies using the different series of densified carbon blacks in natural rubber, GR-S X-478, and Butyl rubber showed the rubber properties were, for all practical purposes, uninfluenced by bulk densities covering the range from the fluffy blacks to the normal densities of the commercial grades. Not all types of rubber compounds, however, perform in this same manner. It has been observed that high loadings of SRF black in nitrile rubber do show definite dispersion differences between fluffy SRF having a bulk density of 12.6 lbs./cu. ft. and dry densified SRF having a bulk density of

22.1 lbs. cu. ft. Laboratory mill mixing of SRF black and nitrile rubber was used to prepare stocks containing 110 parts of SRF and 10 parts of an ester-type softener.

The rubber was premasticated for three minutes on a cold, tight laboratory mill. Softener was added, followed by the SRF carbon black. Stocks were aged overnight and remilled. Photographs of the stocks after being sheeted off after remilling are shown in Figure 7. The rough appearance of the stock prepared from the densified SRF of 22.1 lbs./cu. ft. density is caused by poor dispersion of such proportions that the black is not uniformly distributed in the rubber, causing an uneven recovery of the processed stock, which is observable as surface roughness. A freshly cut section of this stock was dull and grainy, compared to a smooth and shiny appearance of the stock prepared from the fluffy SRF black.

These stocks were dissolved in a solvent forming a thin cement to see whether dried films of the cement on glass could be used to observe microscopic dispersion differences. Figure 7 also shows photomicrographs of the films at 200 X magnification. The presence of larger clumps of black in the cast film corresponding to the dry pelletized SRF stock is readily apparent.

It is recognized that the properties of nitrile rubber are especially sensitive to the degree of dispersion of carbon black. For this reason special precautions are recommended for the incorporation of carbon black (15).

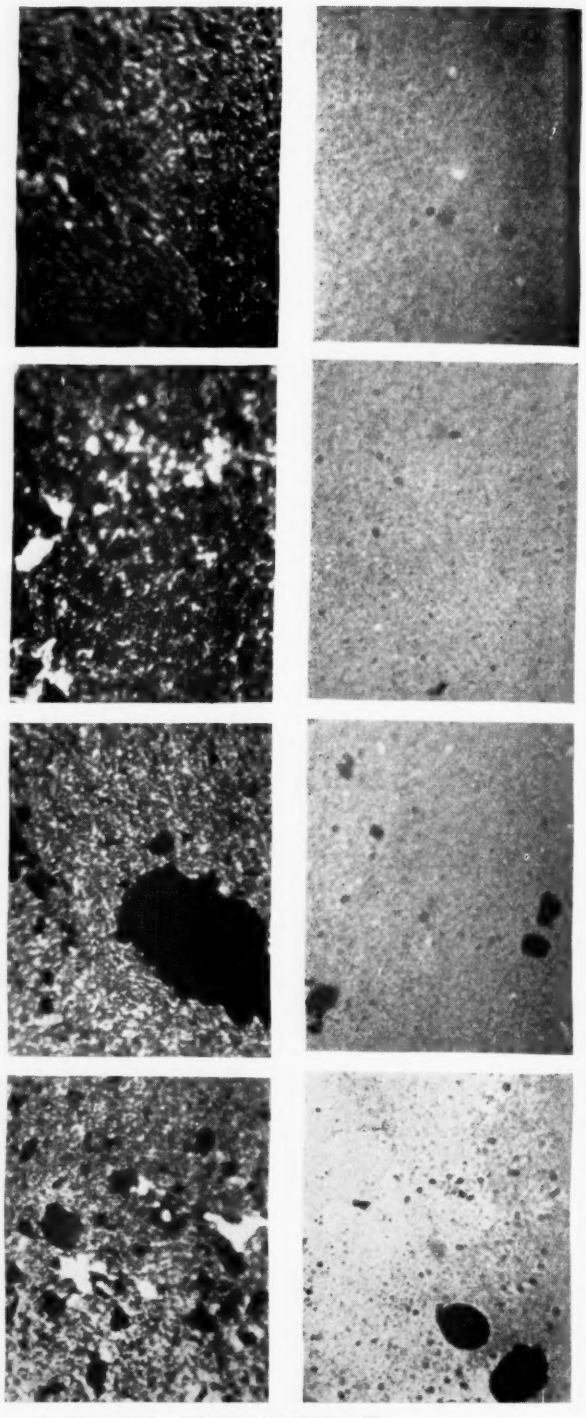
As a practical matter, the differences in dispersion and the appearance of the fluffy and pelletized SRF loaded stocks can be greatly modified by processing and compounding techniques. Banbury mixing instead of roll-milling of the same stocks improved dispersion in both cases although differences between the fluffy and pelletized SRF stocks were still noticeable. It was surprising that a change from one type of ester softener to another type, di-iso-octyl phthalate, improved the dispersion of both the fluffy and densified SRF stocks to such a degree that stocks were shiny and smooth.

Carbon Black in Polyethylene

Black polyethylene compositions have shown such remarkable outdoor weathering properties that their use for wire and cable sheath has recently become of practical importance. This development of the Bell Telephone Laboratories has been described by Wallder, Clarke, DeCoste, and Howard (16). Unpigmented polyethylene has extremely poor weathering properties because of its sensitivity to ultra-violet light degradation. The presence of small quantities of carbon black dispersed in polyethylene acts as a light absorber or screener, preventing the penetration of the ultra-violet light into the body of the material.

In the rubber industry it is generally accepted that black compounds age better than do non-black compounds. Some confusion on the aging of black rubber stocks has arisen from the use of oven-aging tests where there is no exposure to light, as would be found in actual service (17). A recent publication by Newton and Wake (18) has shown conclusively that black rubber-coated fabrics are more resistent to the embrittling effects of sunlight exposure than are non-black coatings. This performance of carbon black can be extended to all thermoplastic materials subject to light catalyzed oxidation reactions.

For an early reference to this property of carbon black we can refer to Thomas Hancock (19), who wrote in 1857, "In the course of my early progress, I found that some of the rubber I employed was very quickly decomposed when exposed to the sun. As the heat was never more than 90°, and rubber when exposed to artificial heat of a much higher temperature was not injured by it, I suspect that light had some effect in producing this mischief. To ascertain this I cut two squares from a piece of white rubber; one of these I coloured black, and



Top Row—Fluffy—Bulk Density 12.9 Lbs./Ft.³
Second Row—Dry Densified—Bulk Density 14.4 Lbs./Ft.³
Third Row—Wet Densified—28.6 Lbs./Ft.³
Bottom Row—Ball Milled Six Hours—Bulk Density 32.6 Lbs./Ft.³

Fig. 8. Polyethylene Dispersions 400 X Magnification

exposed the two to the sun's rays; in a short time the piece that had been left white wasted away, and the sharp angles disappeared, and it assumed the shape of a piece of soap that has been some time in use; the blackened piece was not at all altered or affected. The lesson taught me by this experiment was of great value ever after."

Since the function of the carbon black is to screen out light, it would be expected that the particle size of the black particles, the concentration of the black, and its degree of dispersion determine its effectiveness for this purpose. It has been found that good dispersions of small particle size, high color channel blacks in concentrations of about three parts will give maximum weathering qualities in polyethylene compositions. The degree of dispersion of the black is very important since the presence of large aggregates can seriously reduce the quality of well-dispersed black at this relatively low concentration. In order to achieve good dispersion of carbon black in polyethylene it is necessary to prepare a masterbatch containing 20-30 parts of black per 100 parts of polyethylene and to control carefully the temperature of mixing so that maximum shearing conditions are maintained. The masterbatch, containing well-dispersed black, is then used to prepare compositions having lower black concentrations.

Carbon blacks are not easily dispersed in polyethylene, and it was of interest to determine whether the degree of dry aggregation, as measured by bulk density, had any appreciable influence on dispersion. For this purpose a series of samples of a high color channel black (Monarch 74) was prepared covering a broad bulk density range. Masterbatches were made containing 25 parts of each of these samples in a laboratory Banbury at a temperature just above 100° C. The masterbatches were used to prepare stocks containing three parts of black on a roll mill maintained at the same temperature. The dispersions obtained in both the masterbatches and the final stocks were observed microscopically. The specimens used for the microscopic examination were prepared by placing a piece of stock about the size of a pin point in a molten drop of rosin on a glass slide, placing a cover glass on top of the speck of stock in molten rosin, and squeezing the cover glass down hard so that a thin section was obtained, and holding pressure on the cover glass until enough cooling has taken place to hold the assembly together. This method of slide preparation is known as the Allen squeezeout technique (20). Photomicrographs of these dispersions are shown in Figure 8. It appears that the dry density of black has an appreciable influence on dispersion. If these dispersion differences are recognized, it is possible, by proper mixing control, to obtain the necessary degree of dispersion with normal commercial varieties of densified blacks.

Conclusions

The influence of the degree of dry mechanical aggregation or bulk densification of carbon blacks on their performance in various media has been described. Water and oil dispersions of carbon blacks are markedly affected by bulk density. A few special applications in polyethylene and nitrile rubber also show the effect. No appreciable influence over the normal and practical range of bulk densities was found for various carbon blacks in elastic media such as natural, GR-S, and Butyl rubbers.

Analogous rheological behavior for carbon blacks dispersed in both rubber and oil was demonstrated.

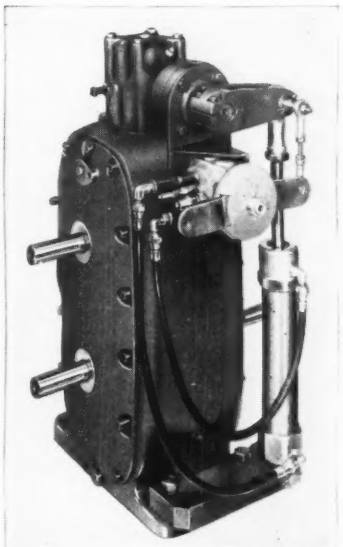
Studies in Butyl rubber suggest that the main factor responsible for the dispersion of carbon blacks is the nerve or elastic property of the medium which causes the disintegration of the carbon aggregates by the continual processes of deformation and elastic recovery or swelling of the raw stock during mixing and milling. Viscosity, as determined by the usual Mooney test, did not appear to have any marked effect on the degree of dispersion of carbon black in Butyl rubber.

Bibliography

(1) "Aqueous Dispersion Characteristics of Carbon Blacks." Paper presented at the meeting of the Division of Rubber Chemistry, American Chemical Society, Detroit, Mich., Apr. 21, 1950. For abstract see India RUBBER WORLD, Mar., 1950, p. 690.
(2) *Rubber Age (N. Y.)*, 55, 577 (1944).
(3) *Chem. Eng. Progress*, 44, 815 (1948).
(4) "New Developments in Masterbatching Carbon Black with GR-S Latices." Paper presented at the April 21, 1950, meeting of the Rubber Division in Detroit. For abstract see India RUBBER WORLD, Mar., 1950, p. 691.
(5) R. Buchdahl, J. G. Curado, R. Braddicks, *Rev. Sci. Instruments*, 18, 168 (1947).
(6) "Industrial Rheology and Rheological Structures," p. 127. John Wiley & Sons, Inc., New York (1949).
(7) Private communication of L. Mullins, British Rubber Producers Association, Welwyn Garden City, England.
(8) *J. Rubber Research*, 16, 275 (1947).
(9) *Ind. Eng. Chem.*, 41, 1607 (1949).
(10) D. Bulgin, *Trans. Inst. Rubber Ind.*, 21, 188 (1945).
(11) "Electrical Resistivity of Various Carbon Blacks in Natural, GR-S, 'Cold' and Butyl Rubbers." Paper presented at the April 21, 1950, meeting of the Rubber Division in Detroit. For abstract see India RUBBER WORLD, Mar., 1950, p. 692.
(12) United States patent No. 2,118,601 (1938).
(13) J. Rehner, P. J. Flory, *Ind. Eng. Chem.*, 38, 500 (1946).
(14) *Ibid.*, 40, 2325 (1948).
(15) "Perbunan—Compounding and Processing," p. 11. Enjay Co., Inc., New York (1943).
(16) "Weathering Studies in Polyethylene for Wire and Cable Applications." Paper presented before the Division of Paint, Varnish and Plastics Chemistry, A. C. S., at Detroit, Apr., 1950.
(17) "Colloid Chemistry," Vol. IV, p. 309 (N. A. Shepard). Chemical Catalogue Co., Inc., New York (1932).
(18) *J. Rubber Research*, 19, 17 (1950).
(19) "Personal Narrative of Thomas Hancock," p. 27. Longman, Brown, Green, Longmans & Roberts, London (1857).
(20) R. P. Allen, *Ind. Eng. Chem. (Anal. Ed.)*, 2, 311 (1930).

Automatic Speed Controls

A NEW line of automatic speed controls for its P.I.V. variable speed drive has been developed by Link-Belt Co., Chicago, Ill., to meet the growing demand for positive, quick-acting, automatic control of rotary motion throughout industry. The new controls are job-engineered for automatically controlling the output speed range of the P.I.V. and are available in four basic types: electronic, hydraulic, pneumatic, and mechanical. Actuated in many ways, including floating rolls, follower rolls, floats, pressure diaphragms, etc., the new controls automatically provide the necessary amount of electrical, hydraulic, pneumatic, or mechanical energy to adjust the P.I.V. output speed by means of motor, piston, or mechanical linkage.



Hydraulic-Type Speed Control

The electronic control is particularly suitable for systems where the control point of a process must be located at a distance from the drive. Its follow-up principle of operation gives smooth, rapid, and accurate speed variation with complete freedom from hunting and over-travel. The hydraulic control is most suitable where extreme sensitivity, highly accurate control, and rapid response are necessary. The pneumatic control is most economically incorporated into systems that are principally pneumatic in operation or require explosion-proof equipment. The mechanical lever-type control offers the best means of operation where sufficient operating force is available to permit direct connection to a simple linkage system.

Glass Fiber Reinforcement Of Foam Rubber[1]

Bailey Bennett,[2] G. H. McFadden,[2] and J. F. Lyman[2]

GLASS fiber in appropriately prepared form has been shown to be an efficient reinforcing material for foam rubber products.[3] Figure 1 is a photomicrograph of glass fiber of the type used in the work reported here. The individual fibers shown in the photomicrograph are between 0.0002- and 0.0004-inch in diameter and have an average length of 1/8-inch. They are essentially very small glass rods which are cut to length by hammer-milling continuously drawn glass fiber.[4]

Glass fiber of the type described above has been found to be readily and thoroughly dispersible in foamed rubber latex. The usual problems associated with dispersion of fibrous materials such as cotton flock, linters, and the like in foamed latex are not encountered when glass fiber of proper dimensions is used. Glass fiber in lengths up to 1/4-inch apparently retains a more or less rigid rod-like form and thus does not ball up like the usual fibrous materials during the whipping process. Hammer-milled glass fiber in lengths greater than 1/4-inch is not easily dispersed in foamed latex since the rod form of the individual fibers is not retained, and balling up becomes possible. While lengths from 1/32- to 1/4-inch are useful as rubber reinforcing agents, the preferred length for general use is 1/8-inch.

Although the individual fibers in lengths of 1/4-inch or less retain a rod-like form of sufficient rigidity to permit complete dispersal in foamed latex, they are very flexible as they occur in finished foam rubber products. It is believed the dispersed glass fiber forms an interlocking network within the vulcanized foam rubber. Marked improvement in physical properties is imparted by this resilient network.

Incorporation of Glass Fiber in Foam Rubber

No elaborate procedure is required in order to use hammer-milled glass fiber as a reinforcing material in foam rubber. A conventional whipping process was used in the experiments reported here. The samples were made with a Hobart mixer having a wire whip-type beater. The calculated amount of dry glass was added after the compounded latex had been partially whipped. The whipping was continued until the foam was extended to the desired volume, at the same time dispersing the glass fiber throughout the foamed latex. At this point a gelling agent was added and dispersed by a few seconds' continued whipping. The foam was then poured into molds, allowed to gel, and cure in steam. Following cure, the samples were washed and finally dried in a circulating hot air oven.

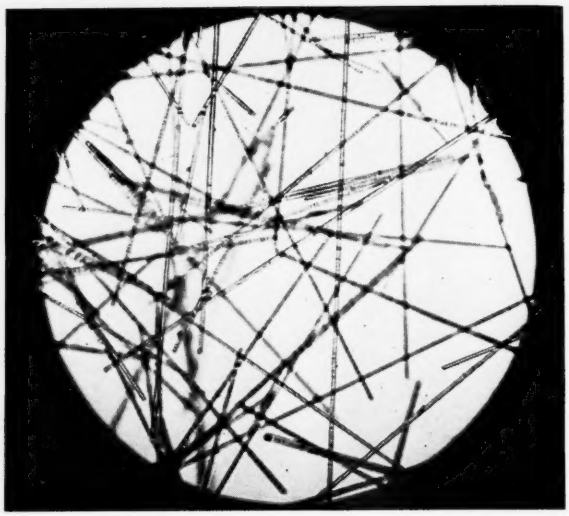


Fig. 1. Photomicrograph of Hammer-Milled Glass Fiber. Actual Size of Individual Fibers: Diameter, 0.0002-0.0004-Inch; Average Length, 1/8-Inch

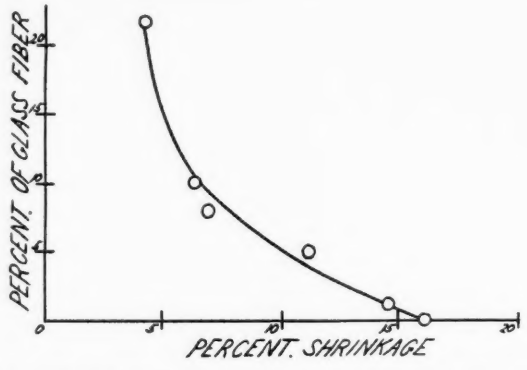


Fig. 2. Effect of Glass Fiber Content on Shrinkage of Foam Rubber

Although incorporation of glass fiber in foamed latex will usually change the characteristics of the foam somewhat, the most pronounced effects are apparent in the finished vulcanized articles prepared from such reinforced foam. Experiments have been conducted on glass fiber reinforcement of natural, natural/GR-S mixtures, neoprene, and various other foams. The results are essentially the same in all cases. Vulcanized foam rubber articles reinforced in this novel manner show greatly reduced shrinkage during curing and drying, increased resistance to compression, and increased tensile strength. Results of various physical tests on a medium density (expanded 700%) 70/30 natural/GR-S glass reinforced foam are reported below.

Shrinkage Control

Shrinkage ordinarily occurs during the curing and the drying of foam rubber products to such an extent that the finished products are substantially smaller than the volume of the foam when first gelled in the molds. Glass fiber reinforcement is a means of control for this type of shrinkage. A small percentage of glass fiber reduced shrinkage considerably, and the amount of shrinkage is reduced in progressively greater amounts as the percentage of glass fiber incorporated in the foam rubber is increased. Figure 2 shows the effect of varying percentages of glass fiber, incorporated in a typical 70/30 natural/

[1] A joint contribution of the Inland Mfg. Division, General Motors Corp., and the Ohio State University Research Foundation.
[2] Department of Agricultural Biochemistry, Ohio State University, Columbus 10, O.
[3] United States patent No. 2,498,785, Bennett, McFadden, Lyman (Feb. 28, 1950).
[4] United States patent No. 2,234,986, Slayter and Thomas (March 18, 1941).

GR-S foam, on volumetric shrinkage of samples prepared from the foam. Percentages of glass fiber are calculated on dry rubber.

This reduction in shrinkage is accompanied by some increase in the density of finished product; representative results for one series are shown in Table 1.

TABLE 1. EFFECT OF GLASS FIBER CONTENT ON DENSITY OF FOAM RUBBER

% of Glass Fiber, on Dry Rubber	Density, Lbs. / Cu. Ft.
0	7.17
1	7.87
5	7.62
10	8.15
15	8.31
20	9.78

Figure 3 is a photograph of three samples of a foam rubber which shows the same general effect of reduced shrinkage with incorporation of glass fiber as described above. The photograph is a side view of the samples, which were prepared in a 12- by 12- by 1½-inch aluminum mold. All three samples were identical except for the amount of glass fiber incorporated in the foam. The top sample contains no glass; the middle sample contains 5% of ⅛-inch glass fiber, and the bottom sample contains 10% of the same kind of glass fiber.

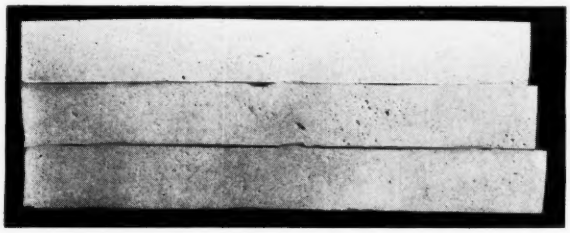


Fig. 3. Effect of Glass Fiber Content on Shrinkage of Foam Rubber. All Three Samples Were Made in the Same Mold. The Top Sample Contains No Glass Fiber; the Middle Sample Contains 5% Glass Fiber, and the Bottom One 10% Glass Fiber

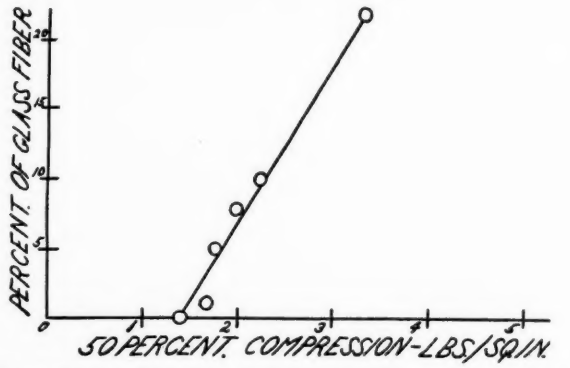


Fig. 4. Effect of Glass Fiber Content on Resistance to Compression of Foam Rubber

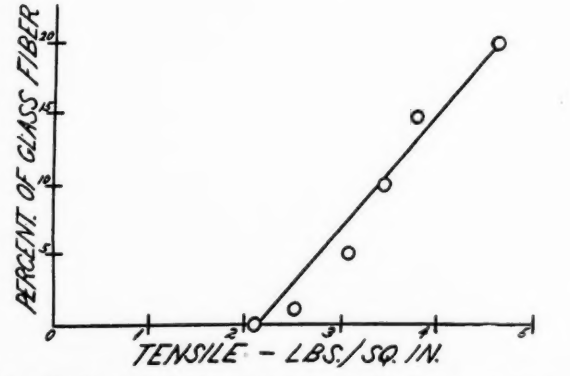


Fig. 5. Effect of Glass Fiber Content on Tensile Strength of Foam Rubber

Although from 1% to more than 20% glass fiber has been successfully incorporated in a number of different kinds of foam rubber, the end-use of the product will dictate the amount of glass that should preferably be used in a particular foam.

Compression and Permanent Set

A series of foam rubber samples was tested in a number of ways to find the effect of glass fiber reinforcement on resistance to compression. The results of one such series of tests are shown in Figure 4. The graph shows the percentage of glass fiber in the samples plotted against the pressure in pounds per square inch required to compress the samples to 50% of their original thickness.

The samples used in this series of tests were 12- by 12- by 1½-inch pads prepared from a 70/30 natural/GR-S mixture. The increased stiffening observed, as the glass fiber content becomes greater, is of practical importance in foam rubber prepared for certain applications. This property may be utilized, for example, in foam rubber auto seat cushions to reduce sidesway.

Cushions similar to those described above were subjected to an accelerated fatigue test in which the samples were compressed to 50% of their initial thickness and then released at a frequency of about 60 times a minute. One-half million compression cycles were used. It was found that those samples containing high percentages of glass fiber showed a tendency to break down under this test. The 15% glass sample showed a slight breakdown at the corners after one-quarter million cycles. The 10% glass fiber sample showed no breakdown at this point and was in much better condition than the 15% sample at one-half million cycles. Samples containing lower percentages of glass fiber showed correspondingly improved results. A 2½% glass fiber sample showed no obvious breakdown even after it had been compressed one-half million times.

Again the ultimate use of the foam rubber will dictate the amount of glass fiber that should be incorporated. For an application where the frequency of compression is relatively small, high percentages of glass fiber may be incorporated to advantage if certain other beneficial effects are desired. A permanent set was observed in all the samples after the above fatigue test. Table 2 shows permanent set in % for various percentages of glass content calculated on dry rubber.

TABLE 2. EFFECT OF GLASS FIBER ON PERMANENT SET OF FOAM RUBBER

% of Glass Fiber on Dry Rubber	Permanent Set After One-Half Million Compression Cycles, %
0	1.44
2.5	1.42
10	1.75
15	4.78

Tensile Strength

Foam rubber invariably displays very low tensile strength and is thus easily damaged by any pulling force. Glass fiber reinforced foam rubber shows significantly improved tensile strength. In the 70/30 natural/GR-S foams described above, incorporation of 15% glass fiber doubled the tensile strength. Figure 5 shows the effect

(*Continued on page 710*)

EDITORIALS

The Rubber Industry and Economic Mobilization

IN MID-AUGUST, while Congress haggled and stalled in its attempts to write an Economic Mobilization Bill and still keep its political fences in order for the November elections, the rubber industry, as represented by the National Security Policy Committee of The Rubber Manufacturers Association, Inc., was hard at work arranging for a reasonable and fairly easy reintroduction of some war-type controls, these controls to be in proper keeping with the present state of "limited emergency" in this country brought about by the war in Korea.

Instead of an earlier plan proposed by officials of the Department of Commerce that would set natural rubber quantity limits for each tire and many other rubber products, industry representatives proposed a simple plan whereby total new rubber consumption for any and all rubber goods manufacturers would be rolled back to the levels prevailing in the year that ended June 30 last. The industry pointed out that such a complicated system as was recommended by the Commerce Department is not needed now and that the product specification method used during the last war would have a bad psychological effect on the public, including continued tire hoarding.

The industry proposal would mean limiting new rubber consumption to about 90,000 tons a month, about a 20,000-ton reduction from the May and June consumption of about 110,000 tons. The major purpose would be not to limit the importation of natural rubber into the United States, but rather to make sure that natural rubber for the strategic stockpile would be available in larger amounts than it has been in the recent past and possibly at a somewhat lower price.

The industry is to be complimented on its foresight in working out a practical plan for the first step in the required economic mobilization for defense brought about by the United Nations' action in Korea. It is the type of plan which is in accordance with the thinking of former President Herbert Hoover, who has stated that the Korean problem "requires but minor controls" and "can be carried with our economy with scarcely a ripple," and also of President Truman, who in his July 19 message to Congress on the situation in Korea, asked only for limited controls.

India RUBBER WORLD hopes that the roll-back plan will actually be the one used to correct the existing difficulty in building up more rapidly our strategic natural rubber stockpile and, if so, would like to suggest that industry leaders then redouble their efforts to encourage the public to exercise patriotic restraint in purchasing rubber products sufficient only for their immediate requirements. Such action has recently been urged by John L. Collyer, of The B. F. Goodrich Co., and Harry L. Humphreys, Jr., of the United States Rubber Co. Although representative of salesmanship in reverse, restraint in consumer buying of rubber products, if it can be fostered, will aid economic stability on the home front in the months ahead and may prevent the introduction of rationing and non-productive red tape.

The Fifth Round of Wage Increases

IN CONNECTION with the fifth round of wage increases now being demanded by the United Rubber Workers, as well as other CIO unions, India RUBBER WORLD believes that another wage increase, if obtained at this time, would not be in the workers' best interests since it would be more likely to detract from rather than add to their real income. Contrary to the position taken by leaders of organized labor, the recent advance in the cost of living does not require immediate neutralization by higher worker income since the advance is expected to be temporary instead of permanent and may only become of long duration if higher labor costs make further price increases necessary.

Much has been written in the last few years about the dangers of the "continuing wage-price spiral," but like the weather, not very much is ever done about it. Price controls and even wage controls have been demonstrated as being much less effective than their adherents claim, but they are the eventual result of repeated price advances and wage increase demands.

The unfortunate thing about the present fifth round wage demands is that their need is based on this recent advance in the cost of living, which is artificially induced by the wave of "scare buying" brought on by the unexpectedness of the Korean trouble and the too vivid memories of shortages during World War II. In most cases inventories are adequate, production higher than ever before, and the estimated reduction in output because of the new defense program not enough to cause real shortages for a long time, if ever.

As "scare buying" subsides and, as is most likely, the threat of another world war in the immediate future is removed, demand will fall off, prices will drop, and "the higher cost of living" argument for wage increases will no longer hold. Any large fifth round wage increase, therefore, would only result in a sharp reduction in the number of hours worked and possibly the number of men working. Real income to all workers following the fifth round would be lower rather than higher.

It would seem apparent that not only would it be to organized labor's best interests to defer or minimize its wage increase demands at this time, but also by virtue of its better income position, when compared to all workers, to make a contribution to the country's struggle for economic stability by not further accelerating the "wage-price spiral" at this time.

DEPARTMENT OF
PLASTICS TECHNOLOGY

The Plastics Calender and Its Auxiliary Equipment[1]

Thomas J. Kerr[2]

THE title of this paper is, perhaps, a misnomer. It would undoubtedly be more accurate to refer to the equipment as the rubber calender adapted to the formation of plastic film and sheeting. The purpose of the paper is to suggest ways in which this machinery might be further improved or redesigned to increase its utility.

Most calender operators have established as standard procedure the following sequence of operations: (1) preblending of the ingredients; (2) Banbury mixing; (3) milling; and (4) the actual calendering or forming of the sheet. There are many ramifications in the practice of individual manufacturers. Some are the result of the adaptation of available equipment to produce best the desired product; while others stem from extensive research and experience in determining how best to manufacture a specific item.

Precalendering Operations

In many plants pigments, fillers, and stabilizers are predispersed in the plasticizer; paint or colloid mills are used to achieve this dispersion. The resultant pastes are added to the resin-plasticizer blend in the preblender, the Banbury mixer, or on the mill.

Plasticizers are often preheated prior to blending to increase the rate at which they are adsorbed by the resin. Some manufacturers use preblenders in the form of jacketed mixers which may be warmed by direct heat. Blenders which heat the stock by forcing hot air through the mixture during agitation are also used. All these operations are designed to increase the adsorption of the plasticizer by the resin, and the intimate dispersion of the stabilizers, pigments, and fillers in the resin-plasticizer system before Banbury mixing or milling. As a generalization, it can be stated that the preblending operations have contributed definitely improved characteristics to the finished film or sheeting.

Since the intimate and complete mixing of the ingredients is accomplished prior to the Banbury mixing, the primary function of this mixer becomes that of a heat exchanger to convert the blended mixture into a plastic mass by raising the temperature of the stock.

This requirement immediately raises the question, "Is this massive machine the most practical and economical heat exchanger for this purpose?"

A considerable proportion of the heating effect obtained with the Banbury is the result of mechanical work in the mixer. This method is definitely an inefficient one of heat transfer. It has been reported that extruders or machines employing the principles of the German mixer have been used in place of the Banbury for turning the stock into a plastic mass, but here again much of the heating is the result of mechanical work.

As the temperature of the mixture is raised toward the point where it becomes plastic, the stock starts to fuse and passes through a stage where it requires a maximum of power to keep it agitated. Agitation is needed at this point to insure that the stock is heated uniformly without decomposition from overheating if it is being handled in quantities which permit the formation of a large plastic mass. This characteristic makes it necessary to find some way to heat the material without allowing it to bulk if we are to obtain a uniform product in the plastic state that will sheet properly without the use of equipment such as the Banbury mixer.

As one approach to this problem, it is suggested that the preblended stock be spread uniformly in a layer on a stainless steel belt or other suitable conveyer, carried through an oven and raised to the proper temperature, and then fed directly to the calender.

Calender Power Requirements

Rubber stocks generally retain considerable nerve while processed on the calender. The processing is usually at temperatures low enough that the stocks retain a maximum viscosity. These conditions require a maximum of horsepower for processing. On the other hand, most plastic compounds are calendered in a molten or semi-molten state in which they have a minimum viscosity. Accordingly, the power requirements for the plastic calender are much lower than for rubber. This point suggests the possibility of designing entirely new equipment for plastics, using a number of smaller rolls to form the sheet and avoiding the heavy construction which is essential to the rubber calender.

Roll Deflection

Calender roll deflection is a major problem for the operator, particularly when he is required to produce films of different gages on the same calender. The viscosity and the plasticity of the stock are varied by many operation conditions. For example, a major change in these characteristics at a given temperature may result from a change in formulation, such as a variation in the type or amount of plasticizer. Changes in speed of the calender will alter the amount of frictional heat produced, and this change in turn will change the viscosity of the stock.

These variables and the thickness of the film being produced affect the force which tends to separate the rolls and thus change the degree of roll deflection. This change in deflection is then the cause of variations in gage across the calendered sheet. The use of heavy rolls has been necessary to minimize the deflection, and the rolls have been crowned to compensate for the deflection that occurs.

Even under these conditions it has not been found possible to obtain uniformity of gage when it is necessary to produce sheets of different thicknesses on the same calender. A degree of crown that will produce an even gage in four-mil film will give a 20-mil sheet that is definitely thin in the center.

Crossing of Roll Axes

Some calender manufacturers recently made important improvements in adapting the rubber calender to the production of plastic sheet of exceptionally close gage tolerances. While this condition has been accomplished by many refinements, one of the major changes is in calender design to permit adjustment of the roll positions both vertically and horizontally. This allows the operator to adjust the rolls in such a manner that the axes of the rolls are crossed.

Crossing of the axes does not alter the position of the rolls with respect to each other at the center, but does bring the rolls apart at the ends and thus produces the same effect as crowned rolls. Even more important, the effective crown may be readily changed by crossing the axes to compensate for the variables of operation conditions and the type of compound used.

Advantages of Four-Roll Calenders

It has been found that the effect on film gage of differentials in temperature and viscosity, as well as variations resulting from uneven feeding, may be more easily controlled by use of a four-roll calender. Four rolls create three stock banks instead of two as in the conventional three-roll rubber calender. This construction makes possible more accurate gaging of the bank between the rolls that form the final sheet and minimizes the effect of uneven feeding on the finished film.

Obviously, the incorporation of more rolls in the calender would permit further refinements in the control of the operation. Based on present design, the size of the machine that would result from the use of additional rolls, and the increased cost of the installation have not encouraged the construction of such equipment.

If the temperature of the stock were raised to the point of minimum viscosity before feeding it to the calender, and the cross-axis principle used to compensate for roll deflection, it appears that it might be possible to design a precision machine using much smaller rolls and a much lighter frame that would still produce a uniform sheet. Such a calender would be lower in cost, easier to install, and cheaper to operate and maintain. It should give even better control of the manufacturing operation because it would be simpler to regulate roll temperatures with smaller rolls.

[1] Presented before National Technical Conference, Society of Plastics Engineers, Inc., Cleveland, O., Jan. 11, 1950.

[2] Plastics and coated fabrics consultant, Collins, N. Y.

Auxiliary Equipment

As the use of plastic film and sheeting has increased, and new uses have developed, the problems involving calender auxiliary equipment to produce decorative effects have become major ones. Much can be done by the equipment manufacturers better to adapt the present embossing, printing, and coating machinery to the handling of unsupported plastic film.

Competition has created the need of producing film and sheeting that is perfect in appearance and possesses improved physical and chemical characteristics. This condition is desirable from the point of view of the general welfare of the plastics industry, but coupled with higher production speeds has created the need of improving the calender cooling and wind-up train to obtain better handling of the film under these conditions.

It was apparent that the applications of plastic film and sheeting would be increased by the use of decorative effects, and it was only natural to turn to the equipment used by the textile and coated fabric industry for this purpose. Textiles and coated fabric, however, have one fundamental difference from plastic film in that they are dimensionally stable under tension. Even the finest of this decorating equipment tends to stretch and distort plastic film, particularly at the elevated temperatures which may be needed to dry printing inks and top coatings.

Many plastics manufacturers have adapted existing equipment for this purpose in their own plants by rebuilding to give it more precision. There is, however, a definite need of embossing, printing, and coating equipment designed to give the film adequate support, handle it without tension, and wind it uniformly and smoothly at high speeds. Machines of this type have been built to the individual requirements of a few processors, but there should be a real market for a line of such equipment correctly designed and carefully built for the whole industry.

In the early production of film and sheeting, calenders usually operated at speeds of from seven to 15 yards a minute. Now film is being produced at speeds up to 100 yards a minute, and sheeting at speeds of 25-40 yards a minute. Experience has taught that the less these products are handled after calendering, the better the condition of the finished goods upon delivery to the fabricator. Thus it has been found desirable to incorporate operations such as embossing, trimming, and inspection in tandem with the calender. Such a set-up not only reduces operating costs, but also improves the quality and appearance of the product. When taken from the calender, the roll of film or sheeting should be ready to pack and ship. Every time the film is rewound the probability of stretching, wrinkling, and uneven winding is increased.

It is not good practice to reduce the speed of the calender for roll changes because of the effect on gage and quality which speed variation induces. If one is producing sheeting in 60-yard rolls at a calender roll speed of 40 yards a minute, a roll change comes every 90 seconds. Film in 200-yard rolls at a speed of 100 yards a minute requires a roll change every two minutes.

Under these conditions it is extremely difficult to cut the sheet and start a new roll smoothly in the time available. Various modifications of the techniques used in the textile and the paper industries for making rapid changes are being employed, but none has proved wholly satisfactory. The industry will benefit greatly from any changes in equipment which can be devised to improve this phase of the operation.

Several manufacturers had independently worked out the techniques of low-pressure embossing for both coated fabrics and unsupported film in tandem with the calendering operation, utilizing the fact that the plastic coming from the calender could be readily molded by embossing rolls. With the sale of the equipment of the Zapon-Keratol plant, knowledge of this process became generally available. At present at least one manufacturer of textile machinery is offering equipment of this type. Further development work is desirable, however, to improve the synchronization of embossing, cooling, trimming, and wind-up machinery so that the film may be handled at high speeds without distortion or mechanical injury.

Summary and Conclusions

Much has been accomplished by the equipment manufacturer in adapting existing equipment for the manufacture of plastic film and sheeting. In the future manufacturers can pace the advancement of the industry by devoting all possible research to the designing of specific machinery for the manufacturing and processing of these products based on the experience of the plastic processors during the past 10 years and in line with the requirements which have developed as the field has expanded.

Paper-Plastics Conference

A PAPER-PLASTICS CONFERENCE, sponsored by the plastics committee of the Technical Association of the Pulp & Paper Industry, will be held on October 19 and 20 at Marshall Hall, New York State College of Forestry, Syracuse, N. Y. E. C. Jahn, committee chairman, is general chairman of the Conference, which will feature the presentation of papers on high polymers, cellulose chemistry, plastics technology, and paper technology.

The program is divided into four sessions, with the first session on "Properties of Plastics in Relation to Papermaking" including the following papers: "New Polymers and Their Possible Application to Paper," Herman Mark, Polytechnic Institute of Brooklyn; "Adhesion Fundamentals," D. B. Hatcher, Plaskon Division, Libbey-Owens-Ford Glass Co.; "Permeability of Polymers," A. D. McLaren, Brooklyn Polytechnic; and "Effect of Plasticizers on Physical Properties of High Polymers," R. S. Boyer, Dow Chemical Co.

The second session, "Beater Addition Fundamentals," also consists of four papers: "Effect of Latex Variables in Beater Addition of Nitrile Latices," and "Effect of Certain Papermaking Variables in Beater Addition of Nitrile Latices," both by D. M. Yost, Sorg Paper Co., and W. H. Aiken, Goodyear Tire & Rubber Co.; "Phenolic Resins in Paper Modified by Acrylonitrile Rubbers," R. C. Bascom, B. F. Goodrich Chemical Co.; and "Headbox Chemistry," V. J. Moser and I. J Gruntfest, Rohm & Haas Co.

The third session, on "Cellulose—Accessibility, Reactivity, and Properties Relating to Plastics," has only two papers scheduled to date: "Accessibility of Cellulose," Harold Tarkow, United States Forest Products Laboratory; and "Kinetics and Equilibria in Cellulose Reactions," H. M. Spurlin, Hercules Powder Co.

The final session, entitled "Plastic Coating Fundamentals," will feature the following paper: "Alathon Polythene Coatings—Properties and Techniques," Alfred Stockfleth, E. I. du Pont de Nemours & Co., Inc.; "Effect of Compounding Variables on Styrene-Butadiene Latex Used for Protective Coatings for Paper," M. E. Wendt and Mr. Aiken, Goodyear; "Technology of Styrene Latex Paper Coating," E. A. Haddad, Monsanto Chemical Co.; and "Versatile Vinyl Enters the Paper Coating Field," A. L. Hatfield, Goodrich Chemical.

SPI Informative Labeling Program

A SPECIAL appropriation for the promotion of its informative labeling program has been announced by Elmer French, Firestone Plastics Co. and chairman of the informative labeling committee of The Society of the Plastics Industry, Inc. These funds are to be used for the following purposes: (1) promotion and publicity designed to educate the plastics industry with regard to informative labeling; (2) establishment of a speakers' bureau to provide personnel to present talks on informative labeling at plastics industry meetings; (3) printing and distribution of a complete handbook on informative labeling to the industry; and (4) preparation of visual presentations for use at expositions and industry meetings. These activities will be carried out by the subcommittee on promotion of informative labeling, under the chairmanship of Amos Ruddock, Dow Chemical Co.

Results of a recent survey conducted in the industry by the committee indicate that more than 5% of the plastic products now being marketed carry labels of some sort, but only 10% of these were classed as "truly informative labels." The bulk of these labels were of the identification type, usually supplying nothing more than the brand name of the plastic used. According to the committee, the effective informative label should cover six points: (1) product name; (2) performance; (3) composition; (4) construction; (5) limitations and (6) guarantee (if desired).

SPI Annual Conference

The Society has scheduled its annual national conference for October 18-20 at Swampscott, Mass. To be held in cooperation with the Harvard Business School, the conference will be restricted to SPI members only, and an attendance of 400 persons is expected, representing the 539 plastics company members in the Society. Morning sessions will be devoted to a program by Harvard professors on such subjects as labor and pensions, production, executive development, industrial marketing, and advertising. Afternoon sessions will include such topics as "Mechanical Properties of Rigid Plastics," "Manufacturing Costs in Molding," "The Future for Moldings over 20 Pounds," "Glass Reinforced Plastics," "After-Treatment of Molded Articles," "A Photographic Study of Polystyrene Molding," and "Preplasticizing Equipment for Injection Molding Machines."

George V. Sammet, Jr., Northern Industrial Chemical Co., is chairman of the program committee for the conference. Other committee members are E. W. Vail, Bakelite Division, Union Carbide & Carbon Corp.; A. A. Lawrence, Dow; J. W. La-

(*Continued on page 691*)

Scientific and Technical Activities

Rubber Division, A. C. S. "International" Cleveland Meeting

A MORE extensive program than usual has been prepared for the fifty-seventh meeting of the Division of Rubber Chemistry, American Chemical Society, which is to be held in Cleveland, O., October 11, 12 and 13, with headquarters at the Hotel Cleveland. This will be an International Meeting, with 40 to 50 delegates from foreign countries attending, many of whom are scheduled to give papers.

F. W. Stavely, Firestone Tire & Rubber Co., chairman of the Division, will open the first technical session at 10:00 a.m., October 11, in the grand ballroom of the Hotel Cleveland. Because of the larger than usual number of papers to be presented, two meeting rooms will be employed on the afternoon of October 12 and the morning of October 13, and Dr. Stavely will continue to preside at the sessions in the grand ballroom of the Hotel Cleveland; while J. H. Fielding, of Armstrong Rubber Co., and vice chairman of the Division, will preside at the concurrent sessions in the Red Room. The technical session will conclude at about 3:30 p.m. on the afternoon of October 13.

This year's recipient of the Charles Goodyear Medal, which will be awarded at the Cleveland meeting, is C. C. Davis, Boston Woven Hose & Rubber Co., and for many years editor of the Division's publication, *Rubber Chemistry and Technology*. Mr. Davis will deliver his medal address at 11:00 a.m. at the session held in the grand ballroom on Thursday morning, October 11.

The business meeting of the Division will also be held at the same session and will take place at 11:30 a.m., following Mr. Davis's paper.

Registration and Room Reservations

Amos W. Oakleaf, Phillips Chemical Co., is chairman of the local committee on arrangements. Room reservation cards for the Hotel Cleveland were mailed to members with the notice of meeting dated August 7.

Registration headquarters for the meeting will be on the mezzanine floor of the hotel and will open at 8:00 a.m., October 11. For the accommodation of those delegates arriving a day early, registration will also be open from 4:00 to 9:00 p.m. on Tuesday, October 10. There will be no preregistration.

Luncheon, Banquet, and Cocktail Party

The 25-Year-Club luncheon will be held on Wednesday, October 11, at the Hotel Cleveland. R. P. Dinsmore, Goodyear Tire & Rubber Co., is chairman for the Cleveland luncheon, and reservation cards and other information will be received from him.

The banquet will be held in the Rainbow Room of the Carter Hotel, Thursday evening, October 12. Tickets may be obtained from F. A. Bonstedt, Sid Richardson Carbon Co., Evans Bank Bldg., Akron 8, O. A reservation form for purchasing these tickets, which are $6.50 each, was included with the notice to members of the Division sent out by Oakleaf's local arrangements committee under the date of August 7.

The annual suppliers' cocktail party will be held in the ballroom of the Carter Hotel from 5:00 to 7:00 p.m. on Thursday just prior to the banquet. Allyn I. Brandt, B. F. Goodrich Chemical Co., is local chairman in charge of this affair.

Plant Trips

For the benefit of the guests from overseas, trips through some of the factories have been arranged for Monday and Tuesday, October 9 and 10, in Akron. Trips have also been arranged to some of the research laboratories on these same two days and, in addition, on October 5 and 6, which are the Thursday and Friday preceding.

Included in the visit to the Firestone plants and laboratories in Akron will be a special exhibit prepared in connection with fiftieth anniversary celebration of that company, which takes place this year.

The Technical Sessions

The total number of papers to be presented at the eight technical sessions: two sessions on Wednesday, October 11; three on Thursday, October 12; and three on Friday, October 13; amounts to 45. As will be seen from the abstracts of the papers given below, only one session is devoted completely to one subject. The Wednesday afternoon, October 11, session is comprised of papers dealing only with latex and latex technology.

A major part of the papers on Friday morning, October 13, in the session in the grand ballroom deals with the subject of natural rubber, its grading, testing, and molecular composition. Similarly, most, if not all of the papers at the session in the Red Room on Friday morning deal with the physical testing of rubber and rubber vulcanizates.

In the abstracts of the papers given below, the author's name in bold face type indicates the person to deliver the paper.

Program and Abstracts of Papers

WEDNESDAY MORNING—OCTOBER 11
Grand Ballroom, Hotel Cleveland
F. W. Stavely, Presiding

10:00 a.m.—**1. Introductory Remarks.** F. W. Stavely, Chairman.

10:10 a.m.—**2. Vulcanization Characteristics of N,N′-Dithioamines in Furnace Black Stocks. M. C. Throdahl** and M. W. Harman, Monsanto Chemical Co., Nitro, W. Va.

The recent adoption of high modulus and high abrasion furnace blacks for reinforcement of natural and synthetic rubber stocks has led to increased scorch problems during mixing and processing. A partial solution of this scorch problem is effected by use of well-known sulfenamide accelerators and sulfur. Still further progress, however, in the reduction of scorch in stocks containing high modulus and high abrasion furnace blacks has been achieved by replacement of the usual free sulfur with certain organic compounds of the N,N′-dithioamine class.

N,N′-dithioamines are a class of organic compounds which contain the nucleus $\rangle$ N-S-S-N $\langle$. Those N,N′-dithioamines reported in this paper were prepared by reacting sulfur monochloride with the appropriate secondary amines possessing alkyl, cyanoalkyl, alkyl-aryl, cycloalkyl, and heterocyclic groups.

In general, many N,N′-dithioamines delay the scorch time over free sulfur two- to three-fold at processing temperatures of 135° C. (275° F.) and yet give equally high modulus and tensile values at curing temperatures 8-10° C. higher. Evidence exists which indicates that the N,N′-dithioamines do not just "liberate" sulfur at vulcanizing temperatures; for the total sulfur content of rubber stocks containing them is usually less than half that required to obtain equivalent cured physical properties when free sulfur is used. The most effective N,N′-dithioamines also impart improved aging and flexing characteristics to rubber stocks containing furnace blacks.

Data demonstrating the scorch and vulcanizing characteristics, aging and flexing properties are given for a series of N,N′-dithioamines in different rubber stocks. The syntheses of a number of these new N,N′-dithioamines are described.

10:40 a.m.—**3. The Bonding of Butyl Rubber to Brass. R. W. Kaercher**[1] and G. W. Blum, Case Institute of Technology, Cleveland, O.

An investigation of some factors important in the adhesion of Butyl-type synthetic rubber to a series of brass compositions is presented. A testing method for the evaluation of comparative bonding strength is shown, based upon the pounds per square inch of tensile pull, normal to the plane of bonding, required to rupture the bond. Brass sheets of nominally 95, 90, 85, and 70% copper were employed, with the balance essentially zinc. The brass disks employed for bonding had one square inch of bonding surface and were bonded by sandwiching a sheet of uncured Butyl rubber between two disks; the Butyl formation used throughout the investigation was a representative inner tube stock. The brass disks were resurfaced for reuse following each experimental determination. The rubber was cured between flat platens without a die, air cooled, and conditioned for 24 hours at 70° F. and 40% relative humidity prior to testing the strength of adhesion. The strength test, made at a constant rate of crosshead travel of 0.025-inch per minute, required approximately one minute to obtain rupture of the bond.

The influence of methods of surface preparation, pickling conditions, and surface contamination upon the various brass compositions are shown graphically. The experimental data obtained emphasize the essential need of uniform surface preparation. Polishing with flour of emery, followed by pickling in the acid bath, produced the highest consistent bond strengths. Accompanying photomicrographs illustrate various degrees of surface uniformity, as well as the non-uniform attack of the acid on the machined surface when the preliminary polishing is eliminated. A pickling composition of equal parts of sulfuric acid, nitric acid, and water to which 0.2%

[1] Present address: research department, American Can Co., Maywood, Ill.

of HCl has been added gave a bright surface suitable for bonding, when used for 10 seconds at 50° C. An induction effect limiting the efficiency of a new mixture was noted; the addition of 10% of a previously used bath acid to 90% of new acid mixture resulted in considerably higher bond strength. Optimum conditions for curing the Butyl rubber were found to be 30 minutes at 325° F., with conditions of undercure deleterious to the bond strength. Investigation of curing pressures from 1,000 to 5,000 p.s.i. showed a critical range of 1,500 to 2,000 p.s.i. for maximum bonding.

The copper content of the brass had a very marked effect upon the bonding. Brass containing 70% copper is superior for bonding over the widest range of conditions; while the 85% copper content brass was bonded successfully only when the pickling time was doubled to 20 seconds. Pickling of the 70% copper content brass at this 20-second period resulted in a badly spotted surface effect and lowered bonding strength. Brass containing 90 and 95% copper never yielded a bond strength exceeding 250 p.s.i., even under longer pickling conditions, in comparison with the strengths obtained for 70% brass exceeding 1,000 p.s.i. The surface contamination caused by exposure to air is shown to be an important factor in maximum bonding strength. The 70% copper content brass was found to be the least critical, with a period of 45 minutes of air exposure maximum before a serious decrease in bond strength was shown. The higher copper content brasses were more readily contaminated by air oxidation, and a much lower time of exposure is permissible for them.

Despite the unique chemical nature of Butyl rubber, the strength of adhesion of Butyl rubber to brass was found to be governed by many of the basic factors previously reported for the bonding of other types of rubber.

11:00 a.m.—**4. Aging of Black Neoprene Jackets. G. N. Vacca,** R. H. Erickson, C. V. Lundberg, Bell Telephone Laboratories, Murray Hill, N. J.

A prime consideration in the choice of materials for outdoor telephone wire is long service life. In the course of development of neoprene compounds for this purpose, therefore, resistance to aging was made an object of special study. As part of this program, samples of experimental wires were returned from the field at intervals for observation. It was noted that while little change occurred in tensile strength with time, elongation decreased fairly rapidly. It was evident that before much confidence could be placed in these materials for long-term use, more complete information on their aging characteristics was necessary. A supplementary program of accelerated testing was therefore undertaken to provide data for correlation with outdoor studies.

Air oven aging tests at temperatures from 70 to 150° C. indicated in each case a fairly rapid decrease in elongation in the early stages of the aging periods, followed by a slower rate of change over comparatively long periods. Data are presented which indicates that loss of elongation follows the same general curve in all cases. Additional samples from the field representing up to nine years of outdoor exposure gave results corroborating those obtained in the oven aging tests in that the drastic loss of the first few years was followed by a much more gradual loss of elongation in later years.

This rapid loss of elongation in the early stages of aging appears to result in part from a continuation of the polymerization and cross-linking processes responsible for the original cure. Further loss of elongation results from oxidative effects on the neoprene molecules. This is indicated by a comparison of the effects of heating a neoprene compound in the presence of air and with air excluded. At 150° C. there is a loss of 20% of the original elongation in approximately two hours regardless of presence or absence of air. Continued heating in air then reduces elongation to less than 10% of original in 30 hours; whereas with air excluded, heating for 144 hours reduces elongation to about 50% of original.

These data on neoprene were compared with similar aging characteristics of black GR-I, GR-S, GR-A, and natural rubber compounds. After 24 days at 100° C. it was found that the GR-I compound had leveled off at 50% of original elongation and that there had been little change in the last 12 days of the aging period. The other compounds ranged from 5% to 20% of original elongation at the end of the 24-day period, and the natural rubber compound was poorest in this respect.

Effect of the aging on brittleness temperature was also determined. It was found that even with elongation reduced to less than 20% of original, brittleness temperature of the neoprene compound was raised only eight degrees. The GR-S and GR-I showed a small change and were comparable with neoprene; while GR-A and natural rubber showed considerable change.

The effect of the aging on the insulation underlying the neoprene jacket was also studied. In this case the insulation was a black GR-S compound, and tests were limited to compression resistance since the insulation was bonded to the conductor. Compression resistance was increased as would be expected, and it was found that the compound was not brittle, but was still satisfactory insulation.

The work reported in this paper shows that eary loss of considerable elongation of a neoprene jacket compound is not necessarily indicative of short service life and that its resistance to heating and oxidation effects of outdoor exposure is such that it can be expected to last at least 20 years.

11:25 a.m.—**5. The Effect of Synthetic Elastomers on the Properties of Petroleum Asphalts. H. A. Endres,** R. J. Coleman, R. M. Pierson, E. A. Sinclair, Goodyear Tire & Rubber Co., Akron, O.

During the 1930's the members of the Dutch Rubber Foundation under R. Houwink and J. M. Van Rooyen evaluated extensively the effect of small amounts of natural rubber powder on the properties of asphalts and carried the program to the point of laying sizable road test installations. This work is being actively followed up by both the Dutch and the British. Since the war, investigation of synthetic elastomers of the GR-S type for the same purpose has been initiated in this country, as reported by R. P. Dinsmore and G. M. Sprowls.

At present the Goodyear research laboratory is making an examination of the different variables that enter into the preparation of a suitable elastomer powder for use in road-type asphalts. These variables can be divided into two categories: those related to the nature and composition of the elastomer—i.e., the polymerization variables; and those pertaining to physical methods of processing the polymer into a powder form. The present study is concerned primarily with the former.

Properties which the rubber powder additives are designed to influence are softening point, penetration, and useful temperature range. The authors have found that the addition of 5-10% of synthetic elastomers increases softening point, decreases penetration, and improves low-temperature properties, and that the extent of the changes is quite critically dependent on the elastomer composition. Since particle size of the powder profoundly affects ease of dispersion and rate of attainment of equilibrium, care must be taken to distinguish between effects due to the polymer itself and to its physical state.

The small-scale evaluation procedure used has consisted of preparation of polymers as latex in four-ounce or five-gallon polymerizatoin vessels, spray coagulating the latex in the form of a fine particle-size slurry, and handling the powders during washing, screening, and drying by methods which maintain the small particle size without cohesion. Although a number of additives and procedures have been investigated to "detackify" the particle surfaces, the standard procedure for this study has been to incorporate additional soaps. The dried powders are incorporated into the mix by slowly trickling them into the stirred asphalt at 300° F.; samples are withdrawn after various heating times. Typical road-type petroleum asphalts have been used. Because of the small amounts of polymer employed and the insensitive nature of the tests, only rather gross effects can be detected.

Among polymerization variables which have been studied to date are: monomer composition (chiefly butadiene and styrene), molecular weight and sol-gel properties, conversion, and reaction temperature. Of these, monomer composition and sol-gel relationships have been found to have most pronounced effects. Over a wide range of butadiene styrene ratios, increasing butadiene content results in improvements in all of the properties tested; polybutadiene is slightly better than GR-S. In the investigation of molecular weight and sol-gel properties, the two extremes in this category represented by vulcanized rubber on the one hand and a soft overmodified soluble polymer on the other are both poor in comparison to polymers which are intermediate in these properties, particularly those prepared so that the polymer has just reached or passed its "gel point"—i.e., contain sol of a maximum molecular weight and gel of a very loose character. Polymers containing this latter type of gel impart gel-like properties to the hot asphalt which are reflected in its flow properties. Conversion and polymerization temperatures have been observed to exert only minor effects.

Synthetic elastomers of optimum properties have been found to equal, and in some respects excel, natural rubber powders. Reclaim powders have been found to have little effect on properties.

The observed effects are discussed briefly in the light of currently advanced theories of the mechanism.

Highway engineers have recognized the deficiencies of asphalt in road construction, particularly its temperature susceptibility, and will welcome means of correcting these. The use of rubber in asphalt compositions for other purposes also shows promise.

12:00 p.m.—**25-Year-Club Luncheon.**

WEDNESDAY AFTERNOON, OCTOBER 11
Grand Ballroom, Hotel Cleveland
F. W. Stavely, Presiding

2:00 p.m.—**6. Influence of Particle Size on Creaming of Rubber Latex by Means**

of **Ammonium Alginate. E. Schmidt** and R. H. Kelsey, Firestone, Akron.

The creaming properties of *Hevea* and GR-S latices under the influence of ammonium alginate were studied as a function of particle size. A set of GR-S samples which differed only in particle size was prepared by treating a small particle-size latex with a critical amount of sodium chloride for varying periods of time. After the particle growth had been arrested by further dilution, the highly diluted latices of different particle sizes were creamed with various quantities of ammonium alginate. The amount of creaming decreased drastically with increasing particle size of the latex.

Varying the stability of the latex (by reducing the electrokinetic potential with salt, or increasing the particle charge by soap addition) without change of particle size, had practically no effect on the creaming properties of the latex.

It was shown that a *Hevea* latex containing a wide range of particle sizes could be separated into fractions, each of which contained any desired range of particle sizes, by successive creaming operations, with incremental additions of ammonium alginate.

A correlation between particle sizes of three dilute colloidal systems (GR-S latex, *Hevea* latex, silica hydrosol) and the concentration of ammonium alginate required for creaming was observed. This correlation held over a wide range of particle sizes (200 to 9000 A.U. in diameter.)

Fractions of a *Hevea* latex, of different particle sizes, obtained by fractional creaming were examined with respect to viscosity and to cream concentration. The maximum cream concentration increased as the particle size was increased, and the viscosity of the concentrates, adjusted to the same rubber and creaming agent concentration, diminished as the particle size was increased.

2:25 p.m.—**7. Direct Reinforcement of Natural Rubber Latex Mixture. J. Le-Bras** and I. Piccini, Institut Français du Caoutchouc, Paris, France.

The possibilities of reinforcing rubber directly by mixing latex with synthetic resins in order to obtain results comparable with the reinforcement of masticated dry rubber with carbon black have been invesigated.

Among other resins, some water soluble resins of the "resorcinol-methanal (formaldehyde)" type, the conditions of preparation and the degree of condensation of which have been determined, give to the natural rubber vulcanizates exceptional mechanical properties, superior to those of the best mixes made of dry rubber and reinforcing carbon blacks.

The polycondensation of the resin is initiated before its addition to the latex and goes on *in situ* afterward. The resin is introduced into a latex which has been heat sensitized by means of trypsin and which also contains the usual vulcanization ingredients, i.e., sulfur, zinc oxide and accelerator. The latex-resin mixture is gelled in hot water at 70° C. within ten minutes after mixing and is then dried and vulcanized in hot air.

Zinc diethyldithiocarbamate gives good vulcanization in hot air at temperatures between 80 and 100° C., and cadmium diethyldithiocarbamate is particularly suitable at temperatures between 100 and 120° C.

Both hardness and modulus of latex-resin vulcanizates increase with increase in the molecular ratio methanal/resorcinol, M/R; whereas elongation at break undergoes only small variation. Furthermore, tensile strength at break, tear and abrasion resistance pass simultaneously through a maximum for a value of the M/R ratio of 1.

The optimum amount of liquid resin to be used is about 10 grams per 100 grams of latex of 60% total solids content. All the properties of such a vulcanizate containing 10% of resin with an M/R ratio of 1 are quite remarkable. Tensile strength at break is about 470 kgs./cm.^{2} compared to about 320 kgs./cm.^{2} for the best carbon black-dry rubber mixes. Tear resistance values of more than 100 kgs./cm. have been obtained using the ASTM method.

Permanent set and flex resistance are as good as for the control latex mix without resin. For the latex-resin mix, resistance to solvents is improved, and dielectric properties and heat conductivity are better than those of a dry rubber-carbon black mix of the same hardness.

Manufactured articles have a bluish-black color due to the oxidation of the resorcinol; their aging, however, is excellent.

2:40 p.m.—**8. The Influence of Soaps on the Gelling Characteristics of *Hevea* Latices. D. J. McKeand**, Dunlop Rubber Co., Ltd., London, England.

Previous contributions to the study of the gelling of concentrated *Hevea* latex by delayed-action coagulants such as sodium silicofluoride have attempted primarily to explain the fact that gelling takes place on the alkaline side of neutrality. This paper discusses further work on the mechanism of gelling with sodium silicofluoride carried out with the intention of interpreting the gelling mechanism from the point of view of changes in particle protection, in particular of soap, as the pH falls.

The change in surface tension with pH for centrifuged latex serum was studied and compared with similar relationships measured for soaps such as castor oil soap, potassium oleate, and potassium laurate. In each case a minimum was shown to exist at or near the normal gelling pH of centrifuged latex, i.e., pH approximately 80 Potentiometric titrations of these soaps showed that this minimum coincided with the hydrolysis of soap ions to acid soap. Measurements were also made on the above soaps of the change with pH of the interfacial tension against xylene.

The results obtained indicate that the hydrolysis of the protective soap layer in a centrifuged ammonia-preserved latex has a considerable bearing on the pH of gelling.

The investigation was extended to a latex of different particle protection: namely, that preserved with Santobrite and 0.1% ammonia. Here high mechanical stability is coupled with poor gelling characteristics.

The addition of castor oil soap was found not only to raise the pH of gelling slightly, but also to turn the paste-like gel into one which was very much firmer.

In order to determine the influence of Santobrite on the stability of latex, additions of Santobrite were made to an ammonia-preserved latex when the mechanical stability increased by an amount almost proportional to the quantity added, thus indicating that the enhanced stability of this type of latex is largely due to Santobrite itself.

It was appreciated that if the Santobrite could be neutralized as a protective agent, then more normal gelling characteristcis might be realized. Accordingly cationic soaps were added, and it was found that a firm gel was obtained at a pH of approximately 8.0. Parallel tests on the mechanical stability were conducted which showed a marked and almost proportional drop in stability with increasing concentration of cationic soap.

Similar tests were made using soaps of non-ionic type, when it was found that although these also caused a similar marked decrease in stability, there was no corresponding improvement in gelling characteristics.

The theoretical implications of the foregoing experimental observations have been considered.

3:05 p.m.—**9. The Zinc Oxide Stability of Latex.** G. E. Van Gils, Stichting Indonesisch Instituut voor Rubberonderzoek, Bogor, Indonesia. **(G. J. van die Bie** will present.)

The "stability" of latex is a very complex and not yet fully defined phenomenon. It varies with the origin, season, and other circumstances. Before the problem can be answered as to the way these factors are of influence, we have first to draw a clearer picture of what is meant by stability.

In this paper we will restrict ourselves to the zinc oxide (ZnO)-stability, a feature most important for latex technology.

As a measure for the ZnO-stability the KOH-number is generally accepted. Although a correlation may exist between ZnO-stability and KOH-number in many cases, we object strongly to accept the KOH-number as a sole specification for the quality of the latex.

We agree that, as latex ages, for instance, the KOH-number as well as the ZnO-stability alters gradually. We also found that when the preservation of latex is delayed, the KOH-number rises and the ZnO-stability drops; but when figures of latex of different origin and different treatment are compared, in most cases no correlation can be found.

For these reasons we advocate the measurement of the ZnO-stability as well, which can be done either by measuring the time of coagulation on heating with a fixed amount of ammonium salt or by measuring the increase in viscosity.

Coming to the discussion of the factors which influence the ZnO-stability, we must make the formal distinction between intrinsic factors and additional factors.

Intrinsic Factors:

1. Age of latex: The older the latex the lower the ZnO-stability. Artificial aging can be carried out by means of enzymes. This subject is already investigated thoroughly by our French colleagues.

2. Composition of the latex: The influence of amino acids is already known (degradation!); during storage acidic constituents are formed which form salts with the ammonia present and so give rise to a higher concentration of ammonium ions. In this way the correlation between KOH-number and ZnO-stability can be explained. A new factor recently discovered by this laboratory is the influence of the quebrachitol concentration on the ZnO-stability.

3. DRC of latex: The higher the DRC the lower the ZnO-stability.

4. Yellow fraction: The higher the yellow fraction content the better the ZnO-stability.

Additional Factors:

Surface active agents of the type of fatty acid—or sulfonic acid-soaps have no influence or only in higher concentrations. Neither are active proteins such as casein, gelatin, globulin, and pepton.

From the non-ionic detergents we found that Emulphor O increases the ZnO-stability; whereas Vulcastab LW is only active in higher concentrations.

The sequestering agents (Sequestrene AA) are active if their coagulating effect on latex is nullified by the addition of a stabilizator which is not active as such.

Very useful stabilizers are the phosphates, with the exception of Calgon (hexameta phosphate), which is only slightly active.

The ZnO-stability is further increased by sodium silicate and sodium hydroxide.

From the substances which lower the ZnO-stability the ammonium salts are only mentioned. Investigations have been conducted with HCl salts of amines, of which some appear to be active.

Although the investigations are not yet completed, we have discovered a substance which promises to become of technical importance for the heat sensitization of latex and for foam rubber manufacture.

3:25 p.m.—**10. Absorption of Oxygen by Ammonia-Preserved Latex. J. McGavack** and E. M. Bevilacqua, United States Rubber Co., Passaic, N. J.

A number of experimental findings that have been accumulated over the past 20 years concerning the absorption of oxygen by *Hevea* latex are described. The details show the experimental methods used and also the rate of oxygen absorption due to bacterial invasion, to agitation in itself or agitation during storage of the latex, to the effect of pH, to the age of the latex, temperature, and pressure, to the introduction of oxidizing agents, and record the changes in the physical properties of the latex such as stability and viscosity, as well as the resultant effects on the rubber and vulcanizates prepared from latex exposed to oxygen. The investigation also shows that the addition of less than 0.2 of 1% of oxygen on the total solids of the latex lowers the Mooney value from 110 to 40, with indications of still lower viscosities with further addition of oxygen.

Absorption due to bacterial invasion of the latex can be quantitatively titrated as carboxyl; while only a very small proportion of the oxygen can be thus accounted for when a sterile latex is oxidized.

The net result of the work indicates that it is extremely important that a user or seller of latex should clearly understand to what measure his material has been exposed to oxygen. The text is supported by tabular data and graphs.

3:50 p.m.—**11. The Kinetics of Cyclization of *Hevea* Latex. M. Gordon,** Dunlop.

According to a process discovered in 1947, dispersions of *Hevea* latex particles in a medium of 70-80% H_2SO_4 are smoothly and reproducibly isomerized to a high molecular weight, cyclized rubber. The process, which depends on the addition of H_2SO_4 to concentrated latex containing suitable stabilizers, is technologically useful and has been patented. It is also suitable for a kinetic investigation of the cyclization reaction. A detailed procedure has been worked out for controlling and checking the composition of the acid latices. A technique has been developed for measuring the density of the purified polymer after exposing it to cyclization for varying times. This technique uses an improved density gradient tube. Unimolecular constants varying over four powers of ten are obtained and vary enormously with percentage c of H_2SO_4 and the absolute temperature T thus:

$$\log_{10} K = 6 + 0.17c - 7105/T.$$

The activation energy E is of the order of 33 Kcals. and appears independent of acid concentration. The measured frequency factors vary between $10^{18.3}$ and $10^{19.8}$ mins.$^{-1}$ between c = 72.6 and 78.5%.

Application of a statistical theory by Flory shows that 13.5% of the isoprene units originally present in rubber is left uncyclized by the reaction. This result is in striking agreement with unsaturation analyses of cyclized rubber made by H. L. Fisher in 1927. That kinetic effect due to the survival of uncyclized units is negligible at a first approximation.

The rate measurements correlate satisfactorily with Hammett's acidity function H_0 over a range of acidities not previously covered kinetically. The reaction is rate controlled chemically and not by diffusion. The method of making rate measurements on stabilized emulsions in strong H_2SO_4 is accordingly of general promise, particularly in the terpene field. A carbonium ion mechanism for rubber cyclization is supported by the present measurements and the rate control attributed to a mobile protonation preequilibrium and a slow deprotonation step. The high activation entropy is accounted for by the charge neutralization during deprotonation. The proton affinity of rubber, i.e., the acidity constant of the base rubber (an important chemical constant), is estimated to be of the order $-^3$ to $-^{10}$.

A critical discussion is attempted of the comparison between the cyclization of rubber and that of other terpenes. Physical and chemical properties, and mechanistic analysis, support the structure for cyclized rubber given by D'Ianni and coworkers apart from a statistical correction.

4.15 p.m.—**12. On the Presence of an Esterase in Latex of *Hevea brasiliensis.*** L. N. S. de Haan-Homans, Stichting Indonesisch Instituut. (**Dr. van der Bie** will present.)

Up to now no mention has been made in literature of the presence of an esterase in latex of *Hevea brasiliensis,* but the presence of a lipase has been proved in the seeds of *Hevea brasiliensis* and in the latices of various other plants, i.e., *Euphorbiaceae.*

Our investigation of the occurrence of a lipase or an esterase in latex of *Hevea brasiliensis* was started during the Japanese occupation of Java, when Van Gils and Altman developed a theory that a fat splitting enzyme might be involved in the process of the spontaneous coagulation of latex.

The investigation was interrupted in 1944; it was taken up again and terminated recently for the time being.

The search for a lipase had no distinct positive result. Ricinus oil and a fatty substance isolated from latex were not affected when emulsified in the latex itself or in any preparation made from latex.[2] Arachis oil was split only to a very slight extent, and monobutyrin only a little more.

However, when a low ester as butyl-, ethyl- and methylbutyrate, amyl acetate, and especially ethyl acetate was used, a distinct esterase activity was proved.

As in so many other respects, the case of enzyme activity latex is very variable.

The following percentages of splitting up the substrates in suitable emulsions were found after 24 hours of incubation at 37° C.; at the start of the experiments the pH was about 8.5, this being about the optimum pH of the enzyme.

butyl butyrate	8.9—13.8%
ethyl butyrate	3.3— 6.3%
methyl butyrate	12.6—13.5%
amyl acetate	7.6—29.1%
ethyl acetate	24.5—59.0%

Until now no mention has been made in literature about the presence of a low ester in latex. However, we were informed verbally by K. C. Sekar, of the Rubber Research Institute of Malaya, that he has found that the volatile acids formed in putrefying latex consists for the most part of acetic acid. Further investigations at the INIRO have shown that the pH of the latex decreases rapidly: this starts immediately after the latex has exuded from the tree so that no bacterial action can have been involved. Possibly the newly found esterase plays a role in the formation of these acids; its special affection for acetates should be in accordance with Sekar's findings of acetic acid in putrefying latex.

The enzyme may be purified by addition of two parts of 96% alcohol to the serum, or by addition of ammonium sulphate, then filtering off of the precipitates proteins and dissolving them in water.

THURSDAY MORNING—OCTOBER 12
Grand Ballroom, Hotel Cleveland
F. B. Stavely, Presiding

9:00 a.m.—**13. Determination of the Molecular Structure of Rubbers by Physical Methods. L. Nielsen**, R. Buchdahl, G. Claver, Monsanto, Springfield, Mass.

Physical methods such as dynamic mechanical tests and infrared spectroscopy are powerful tools for determining the chemical and molecular structure of synthetic rubbers.

Dynamic shear moduli and mechanical damping were determined over a temperature range for a series of styrene-butadiene rubbers in which the ratio of the starting monomers as well as the polymerization conditions were varied. The dynamic properties were determined with a recording torsion pendulum of a new design, and a brief description of the instrument is given. All the rubbers show a transition range where the material changes from a rubber to a rigid solid, and the damping goes through a maximum. The temperature of maximum damping is primarily a function of the ratio of styrene to butadiene in the copolymer, but changes in the polymerization conditions also bring about some shifts in this temperature. The width or broadness of the damping temperature peak depends quite strongly on the polymerization variables. The width of this peak depends upon the heterogeneity of the rubber on a molecular scale. In the case of extreme heterogeneity more than one damping peak has been observed. The effect of regulators in this connection is illustrated.

Evidence is presented which indicates that if it were possible to produce a pure butadiene rubber in which there were no crystallinity and no cross-linking, such a material should remain a rubber down to about —140° C.

Infrared spectroscopy brings out structural details on a scale even smaller than do the dynamic mechanical tests. As other investigators have shown, the infrared spectra will indicate the relative amounts of cis-trans isomerism and 1-2 or 1-4 addition in the polymers. Infrared absorption curves have been made on a series of rubbers in order to correlate, if possible, the spectra with the mechanical properties and the swelling properties in benzene.

9:25 a.m.—**14. Influence of Fillers on**

[2] The preparations from latex were: the yellow fraction of the latex and serum obtained by freezing latex or yellow fraction. As latex and its preparations are good emulsifiers, sufficient emulsification was obtained by shaking the mixtures vigorously by hand in small glass stoppered Erlenmeyer flasks for three minutes.

the Elastic Modulus and Swelling of Butyl Networks. R. L. Zapp, Esso Laboratories, Standard Oil Development Co., Linden, N. J., and E. Guth, University of Notre Dame, Notre Dame, Ind.

The reinforcement of elastomeric vulcanizates by filler particles has been studied with a polymer of limited unsaturation such as commercial Butyl rubber. The limited unsaturation insures a comparison of filler reinforcement in materials of constant concentration of chemical crosslinks; for an excess of curing agents over and above that required for reaction at all points of unsaturation can be added without increasing the state of cure beyond a definite point. Under such conditions differences in the adsorption powers of fillers will not result in variation in the ultimate state of vulcanization.

Reinforcement in this paper was defined as the ability of a pigment to enhance the elastic or equilibrium stress (at constant elongation) of a vulcanized specimen. Equilibrium stress at 50% elongation was determined on a triple-beam balance, and the components of stress, internal energy, and entropy contributions were differentiated. When just the entropy contribution to stress was considered, such values adhered more closely to the classical viscosity analog equation for reinforcement where only the volume concentration of filler and not the surface area is the controlling factor. It was observed that carbon blacks, especially the finer varieties, possessed a greater internal energy contribution to stress than did mineral fillers. The increase in stress upon the addition of mineral fillers was due in great part to entropy contributions.

Another manifestation of reinforcement was shown to be the restriction of volume swelling of a network (in a good solvent) by the addition of pigments. Carbon blacks showed the greatest restriction of swelling capacity, and contrary to stress observation this restriction was related to the total surface area of carbon black added to the rubber compound. With mineral fillers, far less restriction was observed, and in some cases an increase in swelling was noted. This can be attributed to poor bonding which results in voids. The photomicrograph of clay particles in a thin stretched section of Butyl shows this effect in Figure 21 of the paper to be presented. The roll of surface forces in the case of carbon blacks has been further demonstrated in a study of the elastic properties of swollen rubbers. The reinforcing nature of carbon black is maintained in a swollen network, while the weak bonds between a polymer and a mineral filler are destroyed when the chains are spread apart by the imbibed solvent, and the stress is similar to an unloaded compound.

9:55 a.m.—**15. Some Optical Examinations of Anisotropy in Vulcanizates. Stefano Oberto,** Pirelli Societá per Azioni, Milan, Italy.

The anisotropic behavior of vulcanizates, as revealed by differences in modulus, breaking load and tear, swelling in solvents, and electrical properties, according to the direction of test, is well known. Anisotropy is attributed both to a state of tension in the rubber phase only and to a preferential orientation of the elongated particles of certain fillers. As regards anisotropy due to processing, such as calendering and extruding, it has recently been recognized that anisotropy due to movement of the stock in the mold during the first phase of vulcanization is even of greater importance.

By submitting spew, slabs, sheets, and test pieces to examination under transmitted polarized light, it is relatively easy to obtain optical evidence of the presence therein of anisotropy caused by movements during molding operations. The localization of the movements may be such as to make it desirable to examine with a microscope at low magnification microtome sections, 50 microns thick, of the vulcanizates. For this purpose a transparent gum compound can be used, but more details can be seen if a small quantity (1%) of carbon black is added.

The transparent compound may be used, always under polarized light, for the direct examination of samples a few millimeters thick—or better, of sections of equal thickness taken from products of different dimensions. The examination is particularly interesting in the case of injection molded products, in which case it is possible to tell from the variations of double refraction when molding conditions favor scorching before the rubber has come to rest.

If a certain quantity of talc, or some other ingredient with elongated strong double-refractive particles, be introduced into the transparent compound, it is possible to observe the orientation of the particles caused by the processing or molding flow. In a calendered sheet, for instance, the talc particles lie almost parallel to each other, but toward the center of the sheet the orientation may be less marked or may occur along slightly different directions. In injection molding, too, the talc clearly reveals flow direction and anisotropy.

Under optical observation, which may be effected in restricted areas, the difficulty of obtaining rubber products, particularly test pieces, which are entirely isotropic is confirmed. Almost pure gum compounds have been examined, but the anisotropy found will probably assume even greater importance in loaded mixings, especially those loaded with carbon black.

10:15 a.m.—**16. The Inflation of a Rubber Diaphragm.** J. E. Adkins and **R. S. Rivlin,** British Rubber Producers' Research Association, Herts, England.

In the theory of large elastic deformations of incompressible highly elastic materials, which are isotropic in their undeformed state, the elastic properties of the materials are expressed in terms of a stored-energy function W (the energy stored elastically in unit volume of the deformed material) which must be a function of the principal extension ratios λ_1, λ_2, and λ_3 defining the amount of deformation. It has, in fact, been shown that W must be a function of quantities I_1 and I_2 which are themselves functions of λ_1, λ_2, and λ_3 defined by $I_1 = \lambda_1^2 + \lambda_2^2 + \lambda_3^2$ and

$$I_2 = \frac{1}{\lambda_1^2} + \frac{1}{\lambda_2^2} + \frac{1}{\lambda_3^2}$$

The form of the functional relation between W and I_1 and I_2 for a pure gum vulcanizate has been found from a number of experiments conducted on test pieces of the material subjected to very simple types of deformation such as simple extension, pure shear, simple torsion, etc.

It has been found that within the accuracy of the experiments W has the form $W = C_1 (I_1 - 3) + C_2 (I_2 - 3)$, where C_1 is a constant, and the ratio C_2/C_1 decreases, in general, as the deformation increases from about ¼ at small deformations.

In order to see how these results may be applied to the interpretation of a rather more complex type of deformation, the problem of the deformation of a thin-plane circular diaphragm of rubber clamped at its circumference and subjected to a uniform air pressure on one of its major surfaces was studied theoretically. This problem had already been studied experimentally by Treloar,[3] who measured the distribution of the longitudinal and azimuthal extension ratios over the surface of the inflated diaphragm. Many of the features of Treloar's results can be explained directly from the theory without lengthy calculation if the stored-energy function W has the form given above.

10:35 a.m.—**17. The Study of Bonded Units.** J. M. Buist and **W. J. S. Naunton,** Imperial Chemicals Industry, Ltd., Blackley, Manchester, England.

In a previous paper[4] we differentiated between methods of testing bonding agents and bonded units; the present paper is concerned with testing bonded units. Complete evaluation of the strength of a unit involves a study of the strength of the component parts: (a) the bond and (b) the rubber. Conventional methods of testing the bond (cf., ASTM D-429) have been shown to be inadequate, and a falling weight impact test has been developd. This test is convenient for testing the strength of the bonding agent, and in order to insure that the maximum stress is imposed on the bond the thickness of rubber should be kept to a minimum (we recommend a maximum thickness of 1/16-inch). Information of direct interest to engineers, such as the maximum blow which the bond can withstand without rupture along with the effect of repeated blows on the strength of the bond, has been obtained. Throughout the work the stresses imposed on the bond have been measured.

The union will be protected by using as soft and as thick a rubber as the limits of strength, stability, and space permit. The effect of fatigue on the rubber and the bond is important, and the stresses developed during repeated impact from various energy inputs with both gum and tread stocks have been measured. With the higher energy inputs the energy absorption of the "pad" has been shown to be larger in the first few blows owing to the energy absorbed in the rearrangement of internal structure. Measurements of the maximum stresses developed with a 1/16-inch thick layer of rubber and with the thickness of rubber to be used in service give an assessment of the efficiency of the design of the unit. For example, increasing the thickness of rubber from 1/16- to one inch can reduce the maximum stress imposed on the bond by as much as 70%. In the design of bonded units it is well known that "shape factor" is important, and previous attempts to explain the phenomena of shape factor have not been entirely satisfactory. We have calculated that

$$I = \frac{S^2 A \cdot 1}{2E}$$

and the implications of this equation are that the only important factors governing either the energy of rupture (I) or the breaking stress (S) are the volume of the rubber test piece (A x 1) and the modulus of the rubber stock (E). This hypothesis has been examined by practical experiments with units having a constant volume of rubber with the following shapes, cylinder, hollow cylinder, square, and ellipse.

A bonded unit can fail in service owing to failure in the rubber, and this may be caused by tear propagation from small flaws, cuts, or abrasions under repeated stressing. A new method of studying the tearing of the rubber stock under impact has been developed and is discussed.

11:00 a.m. **Goodyear Lecture. C. C. Davis,** Boston Woven Hose & Rubber Co., Cambridge, Mass.

11:30 a.m. **Business Meeting.**

[3] *Trans. Inst. Rubber Ind.*, 19, 201 (1944).
[4] *Ibid.*, 25, 378 (1950).

THURSDAY AFTERNOON—OCTOBER 12
Grand Ballroom, Hotel Cleveland
F. W. Stavely, Presiding

2:00 p.m.—**18. Butadiene-Styrene Resinous Copolymers.** J. D. D'Ianni, **L. D. Hess,** W. C. Mast, Goodyear.

In the past five years resinous copolymers of butadiene and styrene have become of great commercial importance. This development has been spurred by the availability of these monomers in large quantities and at low prices as a result of the synthetic rubber program sponsored by the government in cooperation with the rubber and the chemical industries.

It was therefore considered of interest to prepare under carefully controlled laboratory conditions polystyrene and a series of five butadiene-styrene copolymers containing from 10 to 50% butadiene for a study of latex and solid polymer properties as a function of polymer composition. The polymers were prepared at 50° C. in a GR-S-type polymerization reaction carried to substantial completion. With increase in butadiene content, the amount of modifier was increased, the reaction time increased, and the pH of the latex from the reactor decreased slightly.

Latex properties examined included viscosity, pH, surface tension, soap requirement, turbidity, mechanical stability, chemical stability, and properties of latex cast films. The average latex particle size, as estimated from turbidity values, decreased regularly with increasing butadiene content, but the variation was small, and all values were in the range for Type 11 GR-S latex. The outstanding fact noted was that as the butadiene content increased, the mechanical stability deteriorated greatly, but the chemical stability (resistance to coagulation with salt) markedly improved.

A wide variety of physical properties of the solid polymers in the uncured state was determined by standard procedures. With increasing butadiene content, the ultimate tensile strength, Shore hardness, Olsen stiffness, and heat distortion point values decreased; whereas the percentage of elongation and the rate of extrusion markedly increased. Water absorption values were unaffected by polymer composition. Refractive index and specific gravity values decreased, but not linearly, with increase in butadiene content. Electrical properties, as measured by power and loss factors, were adversely affected by increase in butadiene content. Oxygen absorption measurements at 150° C. showed an increase in rate of absorption with increase in butadiene content.

No compounding data are reported, but a brief summary of the literature on the use of high styrene resins in rubber compounding and in latex and solution applications is included.

2:30 p.m.—**19. Plastics from Natural Rubber.** G. Salomon,[5] G. J. van Amerongen, G. J. van Veersen,[6] G. Schuur, **H. C. J. de Decker,** Rubber Foundation, Delft, Holland.

Since 1938 an extensive research program has been carried out by the Rubber Foundation on the correlation of chemical structure and mechanical properties of macromolecules. In the course of this research, methods for the preparation of rubber derivates from acid-stabilized natural latex were discovered. The properties of these products have been studied and can be interpreted in a general way from their molecular structure.

The primary reaction products consist of particles corresponding in size with the original, slightly cross-linked macromolecules in the latex globules and are therefore insoluble. As a consequence, the technology of latex derivatives differs considerably from that of the same or a similar derivative prepared in solution. Several applications are at the technical stage.

Latex chlorinated rubber has a lower chlorine content and a slightly lower stability compared with the classic product prepared in solution. Besides that it is often virtually insoluble in the conventional paint vehicles because of a slight amount of cross-linking. On the other hand from the product a stable latex can be obtained, which makes new applications possible. After adding a suitable amount of plasticizer and stabilizer, coherent films of satisfactory properties can be produced from this latex. Recently a properly soluble chlorinated rubber of high chlorine content (up to 70%) was obtained by means of an aftertreatment of the latex chlorinated rubber.

Cyclized rubber from latex, an insoluble, thermoplastic, finely divided powder, can be processed with softeners of the paraffinic oil type and with cheap fillers. It differs from the known derivative by the remarkable reinforcing effect it has on rubber, when mixed in the form of a latex with rubber latex. This intimate mechanical mixture of latices can be processed and vulcanized as an ordinary rubber latex, or it can be dried and then treated according to normal solid rubber technology.

Rubber hydrochloride from latex is also obtained as an insoluble, finely divided powder, but it differs from the foregoing products by its high degree of crystallinity.

Part of this crystallinity pertains even near the decomposition temperature at 130° C. Processing methods have therefore to be adapted to these general properties, which resemble those of "Saran." The following three different possibilities of application have been developed.

1. High temperature processing can be facilitated by a partial breakdown on the mill of the carefully dried powder. The compounding temperature may thus be reduced to approximately 100° C. Small quantities of plasticizers are taken up readily. Larger quantities of even up to 60% are only retained by the polymer in the case of special types of plasticizers. Fillers are also taken up readily by the broken-down material.

Products can be manufactured by calendering, molding, or extruding They possess outstanding chemical resistance in the dark. Light-aging is improved by the addition of pigments. Hardening, caused by after-crystallization, can be controlled by suitable compounding.

2. Films from the water-dispersed rubber hydrochloride can be prepared by adding a plasticizer emulsion and spreading on a metal belt, drying, and heating until gelation takes place above 100° C. Breakdown of the polymer on the mill is thus avoided, and full advantage is taken of the original high molecular weight and stability. Water impermeability and mechanical properties of such films are comparable with those of Pliofilm.

3. Low temperature processing has been worked out lately. In contrast to the previous method the *dry* hydrochloride powder is combined with suitable softeners under conditions which make the breakdown of the large molecules unnecessary. Full advantage can be taken of the possibility to produce highly orientated products from the crystalline polymer.

[5] At present scientific adviser to the Rubber Foundation and to the National Council for Industrial Research T.N.O.

[6] Present address: Plastics Research Institute T.N.O., Delft.

3:00 p.m.—**20. Reinforcement of Rubber. R. Houwink,** Rubber-Stichting, Delft.

It appears impossible to define the reinforcing of polymers in respect to their mechanical behavior in general, but only in respect to a particular mechanical property. Examples are given that reinforcement in a certain direction may even involve weakening in other respects.

A thermodynamic approach to the background of reinforcement along similar lines as has been made to the principles underlying the phenomenon of plasticizing does not lead to a satisfactory result.

There is evidence that instead of applying thermodynamic laws of an integral character it is more justified to apply a type of spot thermodynamics emerging from step by step heat of adsorption measurements. Along this line it appears that the topographical conditions on the surface of filler particles play a prominent part in reinforcement.

The Mullins' effect can be related to the presence of sites of different adsorption energy.

A comparison is made between the classical reinforcement by discrete particles and the structural reinforcement by resins.

Considering the problem of reinforcing rigid polymers, the conditions appear to be just opposite to those for soft polymers. The fact that for the rigid ones coarse fillers are to be preferred is explained with the aid of an improved distribution of stresses.

The applicability of stress-strain curves for studying reinforcing effects is disputable.

3:35 p.m.—**21. A Dynamic Study of Reinforcement.** J. R. S. Waring, Imperial Chemical Industries. **(J. M. Buist** will present).

Reproducible results on the dynamic modulus of tread stocks of natural rubber, Neoprene GN, GR-S, and Perbunan can be obtained if sufficient attention is paid to the control of such factors as static load, bonding of the test sample, temperature and temperature history, amplitude of vibration, and vibration history. Measurements in the range 100-300 cycles per second show that doubling the frequency of test has little effect, with the possible exception of Perbunan. Experimental values are given for the temperature and amplitude coefficients of dynamic modulus.

The importance of dynamic modulus, measured under controlled conditions, as an estimate of the general level of reinforcement is discussed. Two further quantitative measurements of this factor, in terms of the strength of the cohesive bonds, are proposed; the first is derived from the temperature variation, and the second from the amplitude effect.

Measurements of the decrease of dynamic modulus and electrical conductivity on the same sample show that the rupture of more than one type of cohesive bond is involved in repeated cycles of vibration. The drop in conductivity observed in GR-S and natural rubber tread stocks must in part be attributed to "decatenation" of the carbon structure. A tentative system of analysis of types of cohesive bond is suggested.

The relative effects of applied vibration and increased temperature in causing changes in dynamic modulus are compared. Certain differences are apparent from the experimental data. On the other hand, a rise in temperature increases conductivity while it reduces modulus; on the other hand, vibration can reduce both modulus and conductivity. An explanation is put forward in terms of a "thixotropic" breakdown of a relatively "hard" static struc-

ture subjected to the directional effects of vibration. The differences observed in the case of increased temperature are attributed to its random (i.e., non-directional) character.

The variation in dynamic properties, when the parameters are changed, is attributed to changes in both carbon-rubber and carbon-carbon configurations. It is suggested that the presence of a structure "dynamcially hard" at small amplitudes is responsible for outstanding resistance to abrasion. This structure, though largely of a "fortuitous" nature and composed of weak cohesive bonds, is readily reformed in the rest periods between the successive blows occurring in the tire service. This "fortuitous" structure is therefore of technological importance.

4:05 p.m.—*22.* **Improvements in Accuracy of Hardness Testing. J. R. Scott,** Research Association of British Rubber Manufacturers, Croydon, England.

Most hardness tests for vulcanized rubber depend on measuring the depth of penetration by an indentor under load; the penetration is measured by the movement of the plunger carrying the indentor. This movement must be measured from a zero position, and the fixing of this position has been the cause of most of the difficulties in obtaining accurate hardness measurements. In most instruments *one* of the following devices has been adopted, either (1) zero load—a known load (small compared with the main indenting load) is applied to the indentor, and its position under this load is taken as the 'zero'; or (2) presser foot—an annular foot, surrounding the indentor, rests on the rubber test piece, and the depth of indentation is measured relative to the plane of this foot, on the assumption that when the tip of the indentor is just touching the rubber it lies in this plane.

Rubber test pieces generally are not perfectly flat and parallel-sided, even though they may be nominally so. It is shown that this fact leads to errors (which may be serious) in hardness measurements by instruments using either of the devices (1) or (2) mentioned above. Moreover, if plied-up test pieces are used to obtain the required thickness, or in testing articles that are very thick compared with their lateral dimensions, large errors can arise if no foot is used. It is therefore concluded that the best general procedure is to use *both* a zero load and a presser foot. Experimental data support this conclusion, which has been embodied in the revised British Standard method (B.S.903) and in the recommendations of Committee ISO/TC/45-Rubber.

Most published standards for hardness testing make no provision for avoiding errors due to friction in the measuring device (usually a dial micrometer gage). Results are given of a cooperative program of tests which show that by applying gentle vibration (e.g., by an electrically operated buzzer) during the test, much more consistent readings are obtained, and it is possible to get better agreement between different laboratories and instruments.

Lubrication of the surface of the test piece with talc produces a definite, though small further improvement in uniformity of results. It is not, however, adequate without vibration and should therefore be regarded as an additional precaution.

4:25 p.m.—**23. Hysteresis of Vulcanized Rubber for Small Elongations. P. Thirion** and J. Martin, Institut Français du Caoutchouc.

The hysteresis of rubber has been studied mostly in the case of large elongations; while for small elongations (of the order of 0 to 100%), and for low speeds, it has not been investigated very systematically. Since many applications of rubber are at low elongations, the value of the study of hysteresis under such conditions is obvious.

This investigation is concerned with whether small deformations may cause hysteresis and if the phenomenon is similar for small elongations to that obtained for medium and large deformations.

For small elongations, the lever dynamometers usually employed in the rubber industry are not convenient because of their inertia and low degree of accuracy. We have therefore designed a piezoelectric quartz dynamometer free of these drawbacks.

It is possible with this apparatus to take photographs on the screen of a cathode ray oscilloscope of the extension and retraction curves (load as a function of elongation), of rubber rings or dumbbells kept at a given temperature (—30 to +70° C.) by a thermostatic bath.

The apparatus works in automatically and can perform, with a minimum of lost time when the reversal of motion takes place, any number of cycles between two given elongations (0 and 100%). The greatest speed of extension and retraction is 48 cms./min., the lowest speed 8 cms./min.

The use of quartz for the measurement of the forces involved has the advantage of giving without any delay the simultaneous values of the loads and of the deformations. Important differences in the results obtained may then appear when they are compared with those obtained by former methods which neglected the immediate effects of "heredity" on the high elasticity.

The new apparatus has been employed in order to find a mode of fixation of the samples giving really significant tensile curves.

It has been found that dumbbell test pieces are preferable to rings, since friction against the pulleys with the latter is an important cause of error even when the surfaces in contact are lubricated.

Further work with this new apparatus is to include a study of the shape of tensile curves for small elongations for a large number of compounds and also, more particularly, a study of the hysteresis of compounds containing fillers.

THURSDAY AFTERNOON—OCTOBER 12
Red Room, Hotel Cleveland
J. H. Fielding, Presiding

2:00 p.m.—**24. A Retraction Test for Serviceability of Elastomers at Low Temperatures.** O. H. Smith, **W. A. Hermonat,** H. E. Haxo, A. W. Meyer, U. S. Rubber, Passaic, N. J.

A retraction test employing large deformations is described which rapidly gives a temperature index correlating with ultimate stiffness of elastomer vulcanizates at low temperatures. This test based on the T-50 test can be used to measure the merit for low-temperature applications of both crystallizable and non-crystallizable elastomers.

Various methods such as torsion modulus tests have been used for the determination of the stiffening of elastomer vulcanizates at low temperatures. Progressive stiffening caused by crystallization of elastomers of regular structure normally occurs over a long period of time. Therefore tests of this type which employ small deformations are not suitable for measuring ultimate stiffness unless long periods of storage at low temperatures are used. Crystallization and the consequent stiffening are markedly accelerated by extensive deformation of the sample prior to cooling.

In the retraction test the sample is stretched 250% and chilled to —70° C. for 10 minutes. The stress is released, and the temperature is raised 1° C. per minute. Temperatures are recorded at which there is 10, 30, 50, and 70% retraction of the original elongation. The temperature as which 70% retraction (TR70) occurs is the preferred index of the relative merit of vulcanizates for low-temperature service.

This retraction test has been used for the study of the low-temperature performance of vulcanizates of GR-S, *Hevea,* and Paracril elastomers. The order of merit is GR-S, Paracril 26NS90, *Hevea;* whereas torsion modulus tests with no storage period rate *Hevea* the best. It is well known that crystallization of *Hevea* causes progressive stiffening on storage at low temperatures, which proceeds slowly under the small deformation of the torsion modulus test. GR-S and Paracril do not crystallize.

A detailed study was made of the behavior of polybutadiene and butadiene-styrene copolymers prepared at various temperatures. It was shown by X-ray and dilatometer measurements that the amount and the rate of crystallization of these polymers increased with (1) decreasing temperature of polymerization, (2) decreasing styrene content, and (3) decreasing combined sulfur in the vulcanizate. The effects of these variables on TR70 are presented. Data also show the correlation of TR70 for these vulcanizates with cold compression set and hardness after low-temperature storage.

2:30 p.m.—**25. Evaluation of Diene-Type Elastomers for Oil and Solvent Resistance and Low-Temperature Flexibility.**[7] R. W. Laundrie, M. Feldon, Government Laboratories, University of Akron, and A. L. Rodde, Office of Rubber Reserve, Washington, D. C.

Copolymers of butadiene with styrene, acrylonitrile, methacrylonitrile, alkyl acrylates, vinylidene chloride, diethyl fumarate, diethyl chloromaleate, methyl isopropenyl ketone, dimethyl vinyl ethynyl carbinol and methyl vinyl ketone; tripolymers of butadiene and acrylonitrile with butyl, 2-ethyl hexyl and octyl acrylates were prepared at 14 to 122° F. on a pilot-plant scale. The resultant polymers were examined in recipes with high carbon black loadings (40 to 50 parts per 100 parts of polymer) for stress-strain properties, resistance to oils and solvents, and low-temperature flexibility.

The stress-strain properties of the polymers with about 70 parts of butadiene were satisfactory, and tensile strength values for stocks cured for 60 minutes at 292° F. decreased in the order of the following comonomers: styrene (polymerized at 41° F.); methyl isopropenyl ketone, dimethyl vinyl ethynyl carbinol, styrene (all polymerized at 122° F.); acrylonitrile, methyl acrylate, ethyl acrylate, octyl acrylate, butyl acrylate (all polymerized at 41° F.); diethyl fumarate (polymerized at 104° F.); diethyl chloromaleate (polymerized at 100° F.); 2-ethyl hexyl acrylate (polymerized at 41° F.); methyl vinyl ketone (polymerized at 104° F.); vinylidine chloride (polymerized at 122° F.); and methacrylonitrile (polymerized at 104° F.).

The low-temperature flexibility, as determined by the Gehman method, of copolymers with about 70 parts of butadiene deteriorated in the order of the following comonomers: octyl acrylate, 2-ethyl hexyl

[7] The work reported herein was carried out under the sponsorship of ORR, Reconstruction Finance Corp., in connection with the government synthetic rubber program.

acrylate, butyl acrylate, vinylidine chloride, ethyl acrylate, methyl acrylate, styrene, diethyl chloromaleate, methyl vinyl ketone, diethyl fumarate, methyl isopropenyl ketone, dimethyl vinyl ethynyl carbinol, acrylonitrile, and methacrylonitrile.. The freeze resistance of the acrylates deteriorated with decreasing molecular weight; the 70/30 butadiene/butyl, 2-ethyl hexyl or octyl acrylates copolymers had better low-temperature flexibility than did natural rubber. The methyl acrylate copolymer was about equivalent to that of GR-S and poorer than that of natural rubber. Only polybutadiene and high ratios of butadiene in certain of the copolymers had low-temperature flexibilities better than those of the three acrylates of higher molecular weight that were tested.

The effect of the various comonomers in the polymers on the resistance to aromatic and aliphatic types of solvents is shown. Of the acrylates, oil resistance in both aromatic and aliphatic hydrocarbons became worse as the molecular weight increased.

The overall resistance to aromatic and aliphatic solvents of polymers with about 70 parts of butadiene and about 30 parts of the following comonomers decreased in the approximate order: acrylonitrile, methacrylonitrile, methyl isopropenyl ketone, dimethyl vinyl ethynyl carbinol, diethyl chloromaleate, diethyl fumarate, methyl acrylate, methyl vinyl ketone, ethyl acrylate, styrene, vinylidene chloride, butyl acrylate, 2-ethyl hexyl acrylate and octyl acrylate.

It is evident from this work that no copolymers made from the foregoing comonomers and butadiene by emulsion polymerization have both satisfactory low-temperature properties combined with oil and solvent resistance, compared to those of a butadiene/acrylonitrile copolymer containing about 20% of this monomer as the objective in oil resistance. The possibilities of using two of these types of comonomers with butadiene to obtain the desired properties are under investigation.

Data are presented that may offer leads to utilization of some of these types of polymers for specific purposes.

2:55 p.m.—**26. Use of Inclined Plane Tester to Determine Intrinsic Low Stress Properties of Rubber Compounds. W. B. Dunlap, Jr.,** C. J. Glaser, Jr., A. H. Nellen, Lee Rubber & Tire Corp., Conshohocken, Pa.

A hysteresis loop test made at low stress over a series of cures provides an extremely accurate measure of rate and/or state of cure.

The test is performed on an IP-4 Serigraph inclined plane test machine using a molded two-inch T-50 type-specimen with a cross-section area of 0.01 square inch. The test pieces are conditioned and tested under controlled conditions of 75° F. and 57% R.H. Data are autographically recorded.

The test is extremely accurate and reproducible and practically eliminates the human element in stress-strain testing.

The load data at 50, 100, and 150% elongation on the shortest cure of the series provide a scorch test accurate enough for practical factory control.

The ratio of modulus on initial load at 50% elongation to modulus on recovery at 50% elongation provides a measure of hysteresis loss at least as accurate and possibly more accurate than one of the standard hysteresis tests which are commonly used.

It is further believed that measurements made in the range of 50% elongation are a more accurate measure of the properties of tire compounds since this range more closely approximates the conditions under which tire stocks operate in service.

This test also provides a considerable saving in testing time so badly needed in most laboratories today.

3:20 p.m.—**27. Ultra-Violet Spectrophotometric Analysis of Organic Rubber Accelerator Masterbatch Stocks. K. E. Kress,** Firestone.

Recent trends in chemical analysis have emphasized use of physical or instrumental methods as auxiliary or alternate methods for established chemical procedures. The ultra-violet spectrophotometer offers a sensitive, accurate, and particularly rapid method of analysis well adapted to control of many organic rubber compounding ingredients, especially where chemical methods may be inadequate or tediously complex and time-consuming.

When a solution of certain unsaturated organic compounds is exposed to ultra-violet radiation, the solution will absorb radiation of a frequency related characteristically to the molecular structure of the compound. This absorption of ultra-violet radiation is selective in nature and relatively strong at only a limited range of frequencies or wave lengths. By exposing a solution of certain accelerators to near ultra-violet radiation (220 to 400 mu), as isolated by the quartz prism of a Beckman Model DU ultra-violet spectrophotometer, and recording the amount of absorption, a characteristic spectral curve of rising and falling ultra-violet absorption is obtained.

Since the intensity, as well as frequency, of vibration is essentially constant for the molecule in a given solution, the intensity of absorption is proportional (within limits of Beer's Law) to the accelerator concentration.

The ultra-violet absorption of solutions of seven commercial accelerators investigated in the thiazole, guanidine, and thiuram sulfide classes were found to exhibit strong and characteristic selective ultra-violet absorption. Prepared mixtures of natural rubber and GR-S polymer with 10 and 25% of a single or a two-component mixture of these commercial organic accelerators were dissolved in CP chloroform and analyzed spectrophometrically.

In practice, the technique is simple and rapid. A typical analysis procedure involved dissolving a 4- to 8-milligram sample of the masterbatch stock in 50 milliliters of chloroform by standing at room temperature for 30 minutes in the dark. This solution is transferred to the one-centimeter quartz spectrophotometric cells without dilution, and the optical densities are recorded at one to three selected wave lengths, depending on type of accelerators present. The concentrations are then calculated according to established equations.

The mathematical aspects of spectrophotometric quantitative analysis were investigated with the object of simplifying and speeding calculations without an appreciable reduction in accuracy. Methods of establishing equations for absolute and relative percent. Composition of single and two-component accelerator masterbatches are described in detail.

Absolute accuracy and precision for a 20% masterbatch were both well within ±1%. This amounted to a relative accuracy of ±5%, and generally compared to limits of the relative accuracy of analysis of two-component accelerator pigment mixtures by spectral methods.

3:40 p.m.—**28. Polysulfide Liquid Polymers; A New Type of Vulcanizable Liquid Rubbers. J. S. Jorczak** and E. M. Fettes, Thiokol Corp., Trenton, N. J.

"Thiokol" LP-2, LP-3, and LP-8 are polysulfide polymers supplied in a low molecular weight liquid state. The polymers are prepared with reactive thiol terminals; so they can be readily converted to a high molecular weight rubber over a wide range of curing temperatures. The cured rubbers have the physical properties characteristic of the polysulfide polymers, but are useful in a wide variety of applications owing to the ease of handling a liquid material.

The polymers are prepared by the reaction of sodium polysulfide with dichloroethyl formal. A small amount of a trifunctional halide is used also to produce a lightly cross-linked rubber. The high molecular weight rubber produced from this reaction is treated with reducing agents to effect a controlled splitting of some of the disulfide groups in the chain. The number of disulfide groups split to yield two thiol groups determines the molecular weight and viscosity of the liquid product. The viscosity can be varied widely to meet needs of specific applications.

The liquid polymers, as prepared, are in a high state of purity and are stable over a period of years. They are readily vulcanized by oxidizing agents capable of reconverting the thiol groups to disulfides. The vulcanization can be controlled so that conversion to the high polymer takes place at any temperature in the range of 0—180° F. with negligible shrinkage. The curing agents which can be used include metallic oxides such as lead and zinc peroxide, organic peroxides such as cumene and t-butyl hydroperoxide, diisocyanates such as toluene diisocyanate, and quinone derivatives such as p-quinone dioxime. In conjunction with metallic catalysts such as cobalt, iron, and manganese, the oxygen in the air can be used to convert thin films.

The liquid polymers can be used with soluble curing agents for the impregnation of leather, fabrics, and wood. Penetration is easily accomplished, and the polymer is then converted to a non-extractible rubber in place. The polymers can be compounded on a paint mill, in a ball mill, or in an internal mixer with fillers and reinforcing pigments. Carbon black, zinc sulfide, titanium oxide, and aluminum oxide are among the best materials for practical uses. In the compound form, they can be used as adhesives, casting compounds, coatings, and sealers.

The cured liquid polymers closely resembles "Thiokol" Type ST in physical properties. They are substantially odorless and have a service temperature from —70 to 300° F. The polymers are resistant to oils, aliphatic and aromatic fuels, and most solvents. They have good electrical properties and excellent ozone and oxidation resistance.

4:05 p.m.—**29. Adhesion of Rubber and Textiles. Part V.** Effect on Adhesion of the Amount of Spun Steple Yarn in the Fabric. E. M. Borroff and W. C. Wake, Research Association of British Rubber Manufacturers. **(R. C. W. Moakes** to present.)

Parts I-IV of this series have been published in the *Transactions of the Institution of the Rubber Industry*,[8] and the present paper continues the series by reporting an investigation of the adhesion of a number of fabrics of different weave incorporating differing amounts of spun staple nylon yarn; the rest is continuous-filament yarn. Before the results from these fabrics are given, critical attention is paid to the method of test, and the conclusions of Part III are confirmed by

[8] 25, 172 (1949).

trials of the direct tension test technique there proposed at varying rates of loading. The effect of the thickness of the rubber layer in the test piece is also investigated.

Using the direct tension test, it is shown that the logarithm of the load required to break the bond btween rubber and the textile surface is linearly related to the number of fiber ends fractured when the bond is broken. This simple relation is not greatly affected by the weave (the same spun yarn being used throughout the series of experiments), and it is shown that fiber fragments are also recovered after the adhesion of continuous filament material to rubber, the number of fragments recovered, and the breaking load observed lying on the same curve as given by the series of spun yarn fabrics. These results, together with experiments on fabrics having loose fiber ends produced by brushing, confirm the hypothesis that the strength of a rubber-to-fabric bond is a simple function of the number of fibers ruptured in breaking the adhesive bond and of the strength of the individual fibers.

5:00-7:00 p.m. **Annual Suppliers' Cocktail Party.** Ballroom, Carter Hotel.

7:00 p.m. **Annual Banquet.** Rainbow Room, Carter Hotel.

FRIDAY MORNING—OCTOBER 13
Grand Ballroom, Hotel Cleveland
F. W. Stavely, Presiding

9:00 a.m.—**30. Some Problems Involved in the Grading and Testing of Natural Rubber. Part 3.** The Relation Between Compound, Viscosity, and Vulcanizate Stiffness. R. F. Blackwell, **C. M. Blow,** W. P. Fletcher, British Rubber Producers' Research Association.

In Parts 1 and 2, references have been made to the relation between the viscosity, as determined by the Mooney shearing disk instrument, of the mixed compounded unvulcanized stock and the minimum strain of the vulcanizate therefrom, i.e., the elongation at a load of 5 kgs/cm^2 of the vulcanizate cured for the period needed to make this strain a minimum.

These results were obtained on one batch of raw rubber using the A. C. S.-1 formula, and further work is now reported in which (a) a range of raw rubbers of different characteristics has been examined, (b) mixing formulae other than the A. C. S.-1 have been used, and (c) mixing procedures have been varied.

Mixings with normal sulphur and low in accelerator content of the mercaptan type generally show sensitivity, i.e., the slope of the regression line of the minimum strain, S_m, on the viscosity of the compound, V_c, is of the order of —0.5 to —1.0. The addition of an amine-type accelerator such as DPG produces both a reduction in the slope of the regression line and a decrease in the strain at a constant V_c. In the same way the non-rubber constituents in the raw rubber affect both these properties. Different samples of rubber, varying in content of accelerating non-rubber substances, show strains and regression slopes related to one another.

Results are presented, and a formula is given from which the minimum strain at a fixed $V_c(=40)$ can be calculated from S_m and V_c.

The Mooney viscosity may be regarded as a rough relative measure of an average molecular weight, but there is no reason to believe that this average molecular weight will completely determine the minimum strains of vulcanizates from a given rubber. It may well be that the distribution of the molecular weights about the mean will, at least, be a modifying factor. It is, therefore, of interest to compare the strain results obtained on a series of mixes prepared from the same ingredients, but with varying procedures. V_c's of approximately 20, 30, 40, 50, 60, and 70 were obtained by three methods: (a) blends of the unmasticated rubber with varying proportions of the same rubber broken down to a viscosity of 20 were mixed with vulcanizing ingredients in an atmosphere of nitrogen so that no further breakdown occurred; (b) a batch of compound was mixed from unmasticated rubber and vulcanizing ingredients in nitrogen and subsequently broken down on the mill to give a range of V_c's: (c) batches were mixed on an open mill under such conditions that V_c varied over the above limits.

While the differences between these three groups of rubbers were not large, they were significant. The practical and theoretical implications of the above observations are discussed.

9:25 a.m.—**31. Part 4.** The Definition and Measurement of "Rate of Cure." **G. Gee,** BRPRA.

There is wide recognition of the desirability of some measure of the rate of cure of a sample of natural rubber, but much difference of opinion as to the meaning of the term. For the purpose of this paper we assume it to have its obvious meaning as a rate constant defining the vulcanization process. It will then be for further discussion whether this is in fact a useful quantity to determine.

According to one school of thought, rate of cure is measured (inversely) by the time to reach optimum modulus in a given compound. It is, however, obvious (a) that this time is only finite when the vulcanization curve possesses a maximum, and (b) that there is no maximum unless the compound shows reversion. Although, therefore, time to optimum cure is technically of great importance, it cannot without further justification be taken as a measure of rate of cure.

A second school of thought relates rate of cure with scorching tendency. Although adequate data are lacking, it appears certain that scorch time must be highly dependent on the viscosity of the mixed compound. Moreover, if a delayed action accelerator is used, scorch time is in effect a measure of the delay period, which is not necessarily related to the subsequent rate of cure.

The U. S. National Bureau of Standards' method of fitting the vulcanization curve to a hyperbola recognizes these difficulties and defines three parameters which may be taken to measure: (1) the optimum modulus (minimum strain); (2) the rate of cure (rate of growth of modulus); (3) the time delay (if any) before the onset of appreciable vulcanization.

This third approach is considered the most satisfactory yet proposed, but still not ideal. Since it neglects reversion, it is not, as it stands, strictly applicable to most natural rubber mixes. A general criticism of this method is that it uses an empirical equation, and we have found it possible to replace this by one derived from kinetic arguments. Possibly even more serious in practice is the difficulty of fitting this or any other multi-parameter equation to a few experimental points. Inevitable uncertainties in the data must be reflected in relatively large uncertainties in the derived constants.

A critical appraisal of these methods requires more experimental data, especially of the early stages of cure. This is now in hand, and a progress report will be presented at the Conference.

9:50 a.m.—**32. The Tackiness of Masticated and Compound Rubber Mixes. A. Van Rossem** and J. M. Vercruijsse, Rubber Research Institute T.N.O. Delft.

In recent years methods have been published by various investigators to measure the tack of rubber mixes, for which purpose special apparatus have been developed. The present writers have modified a method applied in 1930 by de Visser for measuring the adhesion strength of rubber flooring with various cements, and allows for the application of an ordinary dynamometer. Two wooden test pieces are covered with the calendered rubber mix to be tested, stuck together under a certain weight, and subsequently separated with a dynamometer; the force is measured.

Various factors which influence the result of this test have been studied experimentally, e.g., the influence of the weight applied, the time of sticking, the roughness of the test pieces, the speed of the dynamometer, and the influence of the temperature.

Subsequently experiments have been carried out with natural rubber mixes. The influence of the plasticity of masticated natural rubber was measured. Between a plasticity of 80-40 Hoekstra-units, the tack was about the same, but below that value tack could not be measured properly as the rubber was torn.

The influence of compounding ingredients such as whiting and carbon black even up to 40 volume % was rather small, contrary to expectation. Softeners improved the tack of the natural rubber mix up to a certain percentage. Those compounding materials which have a tendency to bloom, such as stearic acid, show a considerable decrease in tack of the rubber mix as is known from practice.

Tack experiments have also been conducted with synthetic rubbers, such as GR-S and various neoprenes. With the GR-S mixings special attention was paid to the increase of tack by various tackifiers, such as Koresin and other synthetic resins.

Consideration is given to the phenomenon of tack in general, and the results obtained are explained in the light of general theory.

10:25 a.m.—**33. Cis- and Trans-Polyisoprenes from a Single Plant Species.** W. Schlesinger and **H. M. Leeper,** Wm. Wrigley Jr. Co., Chicago, Ill.

Previous published investigations have supported the contention that gutta (trans) and caoutchouc (cis) type of polyisoprene hydrocarbon polymers do not occur simultaneously in a single plant.

Our study reveals the existence of both gutta and caoutchouc in chicle. These two types have been found both in commercial chicle and in a sample of chicle especially obtained for this investigation from a single tree.

For isolation of the polymers, chicle, in the form of a whole dried latex, is dissolved in benzene and centrifuged to remove the insoluble portion. The benzene solution is treated with ethyl acetate to insolubilize the gutta, and the filtrate from the removal of the gutta is treated with acetone to precipitate caoutchouc.

An alternative method of isolation of the polymers involves acetone extraction of the whole chicle, followed by extraction of the acetone insolubles with cold petroleum ether. The caoutchouc is soluble in cold petroleum ether, while the gutta remains undissolved. The caoutchouc fraction is

precipitated by treatment of the filtered petroleum ether extract with excess acetone. The insoluble residue from the petroleum ether extraction is steeped in benzene, and the resulting mixture is filtered. The gutta fraction is precipitated by addition of two volumes of ethyl acetate to this benzene filtrate.

Average analyses show the gutta to comprise about 14%, and the caoutchouc, 4%, of chicle. Four samples of chicle, obtained from different geographical sources, yielded both polymer types in approximately the same percentages. The gutta, after purification, is a white granular material melting at 69-71° C., whose number average molecular weight is approximately 10,000. The caoutchouc, when pure, resembles a well-masticated sample of natural rubber pale crepe and has a number average molecular weight of about 90,000.

Carbon-hydrogen analyses and infrared absorption spectrum measurements confirm the identification of the polymers isolated from chicle, with the cis- and trans- forms of polyisoprene.

10:50 a.m.—**34. Aspects of the Problem of Obtaining Uniform Malayan Rubber. R. G. Newton,**[9] M. W. Philpott, H. Fairfield-Smith, and W. G. Wren[10], Rubber Research Institute of Malaya, Kuala Lumpur, Malaya.

The paper discusses the variability of Malayan rubber, with particular respect to Mooney viscosity and vulcanizing characteristics. The data were obtained from a sampling survey carried out preparatory to the introduction of a scheme for providing technically uniform Malayan rubber, based on the classification already in use in Indo-China.

All types of rubber examined showed considerable variability, but the several visual grades of smoked sheet (RSS 1, 2, 3, and 4) differed little in the properties examined. No technical justification was found for the downgrading of RSS on account of the presence of bubbles in the sheet, and it is suggested that one effect of this practice is to prevent fast-curing rubber from coming on the market. Marked differences in level of technological properties were observed for certain secondary or special types, such as rubber made from centrifuge skim latex, undiluted latex, etc.

The survey of RSS 1 was designed to permit the analysis of total variability into components. For estate-produced rubber the largest single component was found to be due to inter-estate differences. Thus estates differed consistently from one another in the technological properties of their product, despite the fact that they all produced uniform rubber as judged by visual standards. Variation between sheets in a bale was found to be considerable, but this is of little consequence since the manufacturer is not concerned with the internal heterogeneity of a bale, but only with its average properties. Variation between bales produced on one day which, if large, would seriously add to the difficulties of providing uniform rubber was fortunately found to be small.

It follows that a day's output (lot) can be adequately classified by testing relatively few representative samples, and large uniform consignments of estate rubber can be built up by grouping lots bearing the same class-mark. The survey indicated that Malayan rubber marked in this manner would appear in the market mainly as "yellow" or "circle" rubber of the French specification.

The grading of smallholders' rubber presents a rather different problem. The survey showed that the total variability of sheets from smallholdings is greater than that from estates, but that individual lots delivered by dealers to packing houses are relatively uniform within themselves. Uniform consignments of smallholders' rubber could, therefore, be obtained by packing the sheets systematically in such a manner that each lot is represented in each bale.

11:25 a.m.—**35. Some Aspects of Peroxide Decomposition and Its Relation to Rubber Degradation. C. E. Kendall,** Dunlop.

The use of mercaptobenzimidazole (MBI) and related compounds as "deactivators" has been advocated recently, mainly by Le Bras and his coworkers, who state that although these compounds do not appreciably affect the rate of oxygen absorption, the amount of deterioration is much reduced. They considered that while the more usual antioxidants function by reducing the rate of peroxide formation, MBI acts by "deactivating" any peroxide formed. It was apparent that an investigation into the reactions of MBI and similar compounds would help explain the action of these substances. During work on this subject, it has been found that under suitable conditions a peroxide—MBI mixture is capable of causing active degradation of rubber.

MBI reacts with alkyl hydroperoxides or hydrogen peroxide to yield the disulfide or higher oxidation products; the reaction is rapid and exothermic. Oxygen is evolved if excess peroxide is present, when *tert.* butyl alcohol or benzene is used as solvents, but not in the presence of cyclohexene or of ethyl or isopropyl alcohol. Ethyl alcohol is oxidized to acetaldehyde. The suppression of oxygen formation with solvents readily attacked by hydroxyl radicals suggests a similarity with Fenton's reagent. Thiourea gives somewhat similar reactions, and a thiourea-hydrogen peroxide mixture shows the typical Fenton's reagent color reactions with aromatic amines. The evidence for OH radical formation indicates that a one-electron transfer to peroxide occurs, and it follows that radicals from MBI or thiourea must also be formed. During the peroxide oxidation of MBI to disulfide, an intense yellow color appears, apparently identical with that given reversibly on heating solutions of the disulfide.

These considerations lead to the conclusion that rubber itself would be attacked and degraded by MBI and peroxide. Addition of MBI with excess peroxide to a benzene solution of natural rubber leads to rapid reduction in viscosity; while neither MBI nor *tert.* butyl hydroperoxide alone has any appreciable effect. Among others, the following have been found to be effective in promoting degradation: MBI, thiourea, thioacetamide, thiouracil, diethyldithiocarbamate salts, MBT (less effective), thiophenol, and—naphthyl mercaptan. Aliphatic mercaptans are ineffective. Degradation can also be effected in rubber on the mill, and the process is being applied to latex.

Apart from their use as plasticizing agents and for preparing depolymerized rubbers, the reagents considered may be of interest as alternatives to the previously recognized peroxide activators.

FRIDAY MORNING—OCTOBER 13
Red Room, Hotel Cleveland
J. H. Fielding, Presiding

9:00 a.m.—**36. Premanganate Oxidation of Polybutadiene Rubbers. F. J. Naples** and J. D. D'Ianni, Goodyear.

The oxidation of natural and synthetic rubbers has frequently been used as a tool for the elucidation of detailed molecular structure, since under ideal conditions the polymer should cleave at the double bonds to produce relatively simple polycarboxylic acids capable of identification.

For example, polybutadiene consisting entirely of 1,4-addition units should yield only succinic acid (omitting end-group effects) under ideal oxidation conditions. Polybutadiene containing 1,4-addition units and a 1,2-addition unit between two 1,4-units should yield a mixture of carbon dioxide, succinic acid, and betacarboxyadipic acid. Polybutadiene containing a branched structure formed by the 1,4-addition of butadiene to an allylic free radical of two 1,4-addition units should yield tricarballylic acid.

Ozonolysis has been employed for many oxidation studies of unsaturated polymers, but ozone may attack the molecule at locations other than the double-bond. This study was undertaken to evaluate acidified potassium permanganate as the oxidant for several butadiene polymers.

The polybutadienes analyzed were emulsion polymers prepared at 50° C. and —10° C., and others prepared with sodium and Alfin catalysts. The purified polymer was dissolved in carbon tetrachloride and oxidized at 30° C. with an acidified aqueous potassium permanganate solution. The reaction mixture was filtered to remove manganese dioxide hydrate; the solvent layer was separated, and the aqueous layer was evaporated to isolate the organic acids. The organic acids were separated by a partition chromatographic technique developed by Marvel and Rands.

In separate experiments the amount of carbon dioxide formed on oxidation was determined. The —10° emulsion polymer produced the least amount of carbon dioxide, and the 50° polymer, the Alfin polymer, and the sodium polymer increased amounts in that order. These results correlated well with the external double-bond content as measured by perbenzoic acid titration. Other experiments showed that volatile acids, such as formic and acetic, were not formed in appreciable amounts.

Analysis of the chromatograms revealed that the largest amount of succinic acid was obtained from the —10° C. polymer, and smaller amounts from the 50° polymer, the Alfin polymer, and the sodium polymer, thus indicating the —10° polymer to possess the most regular structure. The sodium polymer produced the largest amount of betacarboxyadipic and tricarballylic acids; whereas the other three polymers produced smaller and approximately equivalent amounts. Tricarballylic acid was definitely shown to be formed by a primary rather than a secondary oxidation process. The chromatograms of the two emulsion polymers and the Alfin polymer were quite similar, whereas the chromatogram of the sodium polymer was entirely different and contained a large number of unidentified peaks.

9:25 a.m.—**37. A Contribution to the Study of Rubber Oxidation and Antioxidant Action.** S. Baxter, **W. McG. Morgan,** and D. S. P. Roebuck, Monsanto Chemicals, Ltd., London.

Mechanism of auto oxidation systems with particular reference to the work of Farmer and Bolland is discussed, and consideration is given to the "interrelation of oxidation and vulcanization reactions"; the importance of chain transfer reactions is underlined.

A new apparatus has been designed to investigate the problem of rubber oxidation in more detail than was previously possible. This apparatus, which is described, per-

[9] British Rubber Producers' Research Association.
[10] London Advisory Committee for Rubber Research (Ceylon and Malaya), London.

mits the simultaneous measurement of oxygen absorption, and deterioration of physical properties of a rubber sample, over a reasonably wide temperature range.

Some preliminary results, indicating the effects of the variants, vulcanization, and antioxidant, are given and discussed.

The technological significance of this type of measurement is considered.

9:50 a.m.—**38. Deterioration of Rubber Under the Influence of Light and Dry and Moist Heat.** A. L. Soden and W. C. Wake, Research Association of British Rubber Manufacturers. (**J. R. Scott** will present.)

Exposure of rubber articles and proofings to tropical atmospheric conditions results in a more rapid deterioration than is experienced in temperate climates. Moist heat aging tests have been proposed as accelerated exposure tests for the behavior of rubber, and a series of experiments is reported in which the effect of exposure to moist heat is compared with conventional dry heat aging in a Geer oven. In addition to this, samples were exposed in two tropical localities, one with a hot dry climate, and the other with a hot wet climate. The samples were in free air, but protected from direct sunlight. It might be thought that the presence of moisture, if absorbed, would enhance chain scission. It is shown that moisture is absorbed in substantial quantities as the aging proceeds, even by compounds normally regarded as non-absorbent. With accelerated tests, the moist heat aging does have the effect of encouraging chain scission compared with compounds aged dry at the same temperature, but the vulcanizates aged naturally show an order the reverse of this. This condition might be due to a temperature differential, but is more likely to be due to the excessive surface deterioration of those exposed dry. This deterioration is the surface crazing caused by oxidation in the presence of strong light.

Rubber, swollen with inert materials to produce an absorption comparable to the water absorbed in the moist heat aging, does not, when aged dry at the elevated temperature, deteriorate in proportion to its swelling, nor is its deterioration comparable to that of the compounds aged in moist heat. The effect of moist heat is other than through the effect of the physical adsorption of water which it also causes.

The behavior of the tropically aged vulcanizates emphasized the importance of exposure to suitable light radiations as part of any accelerated "tropical" test. The infrared adsorption spectra of these rubbers show the profound changes which occur at the surface due to light catalyzed oxidation. The early stage of this light catalyzed oxidation manifests itself as a stiffening in very thin films of rubber. This stiffening is easily followed by simple modulus measurements and can be correlated with changes in the absorption spectra of the rubber. Tests of this type for detecting the tendencies toward light stiffening and surface crazing may thus be of greater importance for simulating tropical conditions than the tensile behavior after exposure to moist heat.

10:10 a.m.—**39. Factors Influencing the Creep and Stiffness of Vulcanized Rubbers. D. H. Cooper,** Dunlop.

The work described in this paper is being carried out with a view to predicting more accurately than is at present possible the deflection of rubber springs. This paper is concerned with stiffness and with creep under a constant load. It shows the influence on these two properties of certain factors, which, though essential to the design of commercial products, are usually omitted from fundamental studies and have never been brought together in one single group of experiments. The variables are now considered under four headings.

(a) In this work, three polymers have been selected to form four basic mixes, a dual-accelerator natural rubber bonding mix, a single-accelerator resilient natural rubber mix, a neoprene mix, and a Hycar mix. Each basic mix has been compounded at four levels of black reinforcement ranging from a pure gum to a heavily loaded stock.

(b) The main experiment has been conducted on cylindrical specimens of diameter/height ratio =1.6, and a subsidiary experiment used to investigate the shape-factor effect in which this ratio is varied from 0-20; the lower limit is obtained by the use of lubricated end specimens. The distinguishing feature of the main experiment lies in the fact that a large number of separate, but similar specimens have been loaded to give two readings in compression, or two in tension, or three in shear, using stresses to 120 p.s.i. and strains to 100%.

(c) The load is in the form of a hanging weight, whose application requires the relatively short period of two seconds, but which can be maintained for any required length of time. Measurements of deflection are made in accordance with a time schedule of 0.3, 1, 3, 10, etc., minutes up to three weeks.

(d) Temperature was controlled at 70° F.

Creep curves of natural rubber are linear against log time over the working range, and the creep rate can consequently be defined by a single parameter.

The shear creep-rate, "a," is proportional to shear strain, and the direct (i.e., tensile or compressive) creep rate is a simple function of direct strain whose gradient at the origin, when plotted against strain, equals the shear creep rate per unit shear strain, "b." The creep rate in compression is slightly less and in tension slightly more than that in shear and expressible in terms of the shear creep rate, "b", and the prevailing stress and strain.

The influence of black reinforcement and state of cure on stiffness and on the above creep constants is shown graphically or by comparative sets of values. A set of figures for comparative dynamic stiffness in shear is also included.

In neoprene, a similar analysis has been carried out, but a power law replaces the above log law.

A discussion follows on the influence of the variable factors on the fundamental mechanism of creep.

From the practical point of view, this report also underlines the need of the strict control of time and other factors during stiffness measurements. An example shows how the deflection of a spring after 48 hours under load may be estimated from a process control test of one minute.

10.35 a.m.—**40. Rheometric Tests and Extrusion.** S. Eccher, Pirelli.

A cylindrical rheometer, Couette type, suited to the experimental determination of the relationship between D and τ (D=rate of shear sec^{-1}, τ=shear stress kg./sq.cm.) of rubber and rubber compounds is described. A full-length report is given of the results obtained on 25 different materials, of natural and synthetic rubbers, and compounds of both, with fillers of various sorts. The measures fall within shear rate limits from 1 to 100 sec^{-1}.

In this interval the relation between log D and log τ is fairly near a straight line. It may therefore be analytically interpreted by the exponential expression Ostwald-De Waele $D = (\tau/c)^n$. The materials are thus characterized in the same interval by the parameters n and c.

An examination is then made of the course of the rheometric curve beyond the shear rate interval specified above; the work done by other experimenters is borne in mind.

Agreed that the expression Ostwald-De Waele is accepted as being of limited validity, attempts are being made to ascertain the limits of approximation of its integration in the case of rheometric flow through a cylindrical hole.

The results of measurements carried out on a two-inch extruder employing the same materials as were tested by the rheometer are then set out in detail. These measurements refer to the pressure and flow with discharge holes of various diameters and with the screw operating at various speeds. The flows range from one c.c. minute to 250 c.c./minute, and the pressures from 20 kgs./sq.cm. to above 400 kgs./sq.cm.; these are associated not only with the speed of the screw and the diameter of the discharge hole, but also with the characteristics of the materials.

An endeavor is then made to link up the results of the extrusion tests with the rheometric measurements, obtaining thereby a satisfactory picture of the whole.

11:00 a.m.—**41. Safe Limits of Sample Thickness for Rubber Oxidation and Aging Studies. G. W. Blum,** J. R. Shelton, and H. Winn,[11] Case Institute.

The rate at which a rubber-like material absorbs oxygen at constant temperature and pressure is determined by the relative rate of the chemical reaction and the rate of diffusion or permeation of oxygen into the sample. At constant temperature and pressure, both will be a function of the concentration of the dissolved oxygen. When one wishes to study the effect of certain variables (molecular structure, vulcanizing agents, sulfur, antioxidants, etc.) upon the *rate of reaction* or oxidizability, it is essential to know that the conditions of the test are such that the factor limiting the oxidation is the chemical reaction and not diffusion or permeation. It is the standard practice in studying the oxidation or aging of rubber to employ samples having a thickness of approximately 0.080-inch or 2.0 millimeters, and to adjust the oxygen pressure and temperature so that the test may be completed in the desired short period of time. When it is sufficient to evaluate relative rates of deterioration of compounds under prescribed accelerated conditions of aging, this procedure causes no difficulty. When, however, one endeavors to draw pertinent conclusions regarding the oxidizability of the compounds from the results of such experiments, many confusing situations arise because the samples are often so thick that the limiting effect of diffusion is appreciable.

The purpose of this paper is to establish safe limits of sample thickness for gum and carbon black vulcanizates of natural rubber and three synthetic rubber types at various temperatures such that chemical reaction, and not diffusion, is the limiting factor. All experiments have been conducted in pure oxygen at 760 millimeters of pressure, using the volumetric oxygen-absorption method described in previous publications from this laboratory.

Oxygen-absorption data obtained with samples of different thicknesses are used to establish approximate safe limits of sample thickness for oxidation and aging studies. A method of calculating the probable limit-

[11] Present address: Firestone Tire & Rubber Co., Akron, O.

ing value of sample thickness above which the rate of oxidation in the autocatalytic stage is limited by diffusion has been developed in the case of GR-S and applied to *Hevea*, Butaprene NXM, and neoprene black and gum vulcanizates.

The conventional 0.075-inch to 0.080-inch thickness is frequently not satisfactory for accelerated aging and oxidation studies if it is desired to avoid limitation by diffusion. The problem is not so acute if the study is confined to the earlier stages of oxidation including the constant-rate stage of oxygen absorption, but not the autocatalytic stage.

Data are presented to aid subsequent workers in the selection of approximate safe limits of sample thickness for use in rubber aging and oxidation studies at various temperatures for both the constant-rate and autocatalytic stages of oxidation.

11:25 a.m.—**42. Evaluation of a Volumetric Oxygen-Absorption Test for Rubber Aging. J. R. Shelton and W. L. Cox,** Case Institute.

A volumetric oxygen-absorption test for aging of rubber has been investigated from the point of view of the effect of cure, and the effect of mercaptobenzimidazole upon the aging behavior. The test has also been evaluated by comparison with conventional air-oven and oxygen-bomb tests, using four natural rubber stocks.

Time of cure has relatively little effect upon the rate of oxidation of either natural rubber or GR-S once a reasonable state of cure has been attained. The uncured compound is considerably more resistant to oxidation than the vulcanizate. Changes in physical properties corresponding to a given amount of oxygen absorbed vary somewhat with time of cure in the initial stages, but after the absorption of four or five milliliters of oxygen per gram of rubber, neither time of cure nor the presence or absence of inhibiter has any significant effect upon the subsequent rate of change in tensile strength for a given amount of oxygen absorbed.

The reported superiority of a combination of mercaptobenzimidazole and a conventional antioxidant has been verified; however, the oxygen-absorption data indicate that the observed additional protection imparted by MBI results from a combination of two factors: (1) the normal antioxidant activity of MBI which reduces the amount of oxygen absorbed; and (2) an effect upon the nature of the cure attained when MBI is present such that the absorption of a given amount of oxygen in the early stages is not accompanied by so great a change in properties. After the early stages of oxidation are completed, the rate of change in tensile strength for a given amount of oxygen absorbed is the same with and without MBI. Thus it appears that the "deactivating effect" of MBI may be the result of the effect of this material upon the vulcanization process, rather than upon the oxidation process.

The three aging tests have been shown to rate four natural rubber compounds qualitatively in the same order. The effect upon physical properties is similar for the oxygen-absorption and air-oven methods (both at 100° C.), but the oxygen-bomb test (70° C. and 300 p.s.i.) apparently results in a higher proportion of chain-scission as compared to cross-linking, and it does not demonstrate as much of an effect due to MBI.

The effect of cure is very slight over the range studied in the case of the oxygen-absorption test; it is somewhat greater for the oxygen-bomb test; and it is very pronounced in the case of the air-oven method. This advantage is an outstanding one of the oxygen-absorption method for aging studies since the effect of cure frequently obscures the effect of other factors under investigation when other aging methods are employed. The oxygen-absorption test thus appears to have a greater potential usefulness as a method for evaluating aging resistance of rubber stocks than the tests now commonly employed for this purpose.

FRIDAY AFTERNOON—OCTOBER 13
Grand Ballroom, Hotel Cleveland
F. W. Stavely, Presiding

2:00 p.m.—**43. Degree of Crystallization of Vulcanized Rubber as Calculated from the Temperature-Coefficient of the Elastic Tension. B. B. S. T. Boonstra,** Rubber Stichting.

Stress-temperature measurements were conducted with two well-defined pure gum mixes in a temperature range of about +100 to —40° C. The vulcanizates were thoroughly relaxed at the highest temperature used in the experiment so that after cooling and reheating the stress attained practically its original value. Though no true equilibrium is reached under these conditions, the changes of temperature were so slow (½ degree per minute) that the stresses measured were supposed not to differ appreciably from the equilibrium values. In cases where the tension after cooling and heating cycle did not reach the original value, the measurements were discarded; in the regular cases the well-known thermodynamical formula was applied.

(E = energy, S = stress, L = length, T = temperature)

$$S = \frac{(dE)}{(dL)} + T\frac{(dS)}{(dT)} - L$$

The plot of S *vs.* T consists for the major part of three straight lines: one for the higher temperature region where the rubber is completely amorphous, one for the lower temperature region when the rubber is partly crystallized, and one at the lowest temperatures where the rubber has reached its maximal crystallinity. These plots are determined at 200, 300, 400, and 500% elongation. In the region of the amorphous state the term $\frac{(dE)}{(dL)}$ is practically zero unless the rubber contains nuclei of crystallites that grow during cooling, as is sometimes the case at the highest elongation (500%). For the second region the value of the term $\frac{(dE)}{(dL)}$ is negative and more strongly so, the higher the elongation at which the measurement was carried out. This energy-term is plotted against elongation, and the area under the curve is integrated; supposing potential energy effects to be negligible, this area represents the crystallization energy set free on elongation to the percentage considered here. Potential energy effects are small when not too high elongations are involved (maximum 500%). By potential energy is meant here energy due to distortion of valence-angles or increase of interatomic distances other than as a result of crystallization.

The heat of crystallization on elongation calculated in this way is compared with the heat of crystallization of a piece of raw rubber of known crystallinity. As such, samples of raw rubber were used which had been stored for more than 35 years in the cellars of the Rubber Institute.

The degree of crystallinity was determined by X-ray analysis methods which have been described by Goppel and Arlman. The same sort of rubber was subsequently made molten by heating to about 70° C. and frozen artificially by cooling to about —20° C. and keeping at that temperature for some days. Again the degree of crystallinity was determined by X-ray analysis.

The heat of crystallization of these rubbers was determined directly by measuring the heat of swelling in toluene of the materials in frozen and in the molten condition; the difference yields the heat of crystallization.

When the heat of crystallization of the pure rubber crystallites is known, it is possible to calculate from the thermodynamic determination of the crystallization-energy of the stretched vulcanized rubber the degree of crystallinity at a definite elongation. The compounds measured were a sulfur vulcanized pure gum mix and one vulcanized with thiuram; the latter showed lower crystallization than the sulfur compound at corresponding elongations.

2:25 p.m.—**44. Applications of Spectroscopy to Vulcanization Studies. H. P. Koch,** British Rubber Producers' Association.

Attention is drawn to the use of ultraviolet and infrared spectroscopy in the identification and quantitative estimation of accelerators and their transformation products in rubber compounds. Such methods have recently been applied to the elucidation of the reaction between MBTS and simple olefins, and the results are discussed. The application of absorption spectroscopy to the identification of the sulfur linkages in cross-linked polymers is intrinsically much more difficult, but changes in the unsaturation pattern of natural rubber have been observed during vulcanization. These changes can now be correlated with recent advances in our understanding of olefin reactivity and furnish virtually conclusive proof of the participation of free radical mechanisms in rubber vulcanization.

2:50 p.m.—**45. Dynamic Properties of Raw and Vulcanized Polymers. R. S. Enabnit** and S. D. Gehman, Goodyear.

A technique is described for preparing samples of raw rubber and rubber-like polymers for dynamic measurements. The polymer is molded between two small concentric brass cylinders using a metal adhesive and a transfer-type mold. The test piece is mounted in a vibrotester, and the inner brass shell oscillated longitudinally to produce a shear vibration in the polymer at about 60 c.p.s. Accuracy of measurement compares favorably to that usually obtained with vulcanized test pieces, and in addition the method is applicable to vulcanizates as well as raw polymers.

The dynamic modulus and resilience of raw polymers were found to be substantially independent of frequency effects within the working range of the instrument. These properties were also found to be unaffected by changes in Mooney plasticity within the range of 35 to 70. Constant amplitude was used in all tests so that amplitude effects were eliminated from the comparisons.

Temperature dependence of the dynamic properties of a raw polymer is shown to deviate significantly from that of the gum stock vulcanizate. The resilience of the gum stock improves at higher temperatures and that of the raw polymer follows the opposite trend.

Data show a definite correlation between the dynamic properties of a series of raw polymers and those of vulcanized gum and tread stocks prepared using them. This correlation is evident despite variations in the curing rate among the different poly-

mers. Pigment loading is shown to affect similarly raw and vulcanized polymers.

The effect of cure on these properties is illustrated throughout a range from the raw state to overcure for *Hevea*, polybutadiene, and styrene copolymers. The resilience of *Hevea* is shown to rise rapidly with cure and decrease on overcure; whereas for the diene polymers studied, resilience decreases initially, followed by a continued rise. High styrene-butadiene copolymers exhibit a greater resilience in the raw state than polybutadiene, but this relation is reversed as the cure progresses.

Curves showing the dynamic properties of raw butadiene-styrene copolymers *vs.* copolymer charging ratio indicate a superior resilience and lower internal friction for the high styrene materials. Similar plots for low-temperature polymers show a pronounced superiority to the 122° F. polymers in all cases. A 41° F. polyisoprene polymer was found to have excellent dynamic properties comparable to those of sodium polybutadiene.

Comparisons were made of raw and cured butadiene-ethylacrylate and butadiene-methylmethacrylate copolymers over a large range of charging ratios. These show continued improvement of resilience with acrylate addition for the raw polymers, but a maximum resilience at about 80-20 butadiene-ester ratio for the cured material.

The ease of measurement, small quantity of material required, and the nature of the correlations observed indicate the usefulness of dynamic evaluations for raw polymers.

Furthermore, it appears possible with suitable background to anticipate fairly well from raw polymer measurements the dynamic properties which can be achieved in a vulcanized compound.

3:10 p.m.—**46. Crystallinity of High Polymers. H. N. Campbell** and M. D. Allen, U. S. Rubber, Passaic.

The crystallization of rubber, GR-S, polybutadiene, and polychloroprene has been studied by direct observation with the polarizing microscope. It is shown that such observations are more reliable in detecting crystallization than are X-ray diffraction methods. The microscopic results check reasonably well with dilatometer studies.

It is deduced that considerable restriction is imposed on the possible motion of molecular segments so that theories of the origin and nature of retractive force in stretched elastomers may have to be modified.

Groups Enjoy Annual Outings

THE annual summer outing of the Chicago Rubber Group was held on July 28 at the Medinah Country Club, Medinah, Ill. The afternoon program featured a golf tournament with more than 180 members and guests participating, as well as swimming and tennis, and was followed by a dinner attended by 260. Door prizes totaling more than $2,500 in retail value were distributed before the dinner through the courtesy of some 130 rubber and supplier companies.

In the golf tournament, Charles Skuza, Central Rubber Co., won low gross and was awarded the United Carbon Trophy donated annually by Charles Baldwin. Second low gross winner, Walter Lahey, B. F. Goodrich Chemical Co., received the United Carbon runner-up trophy; while third prize went to Francis Frost, Frost Rubber Works. Blind bogey winners were: L. Van der Coy; Joe Hanisko, Williams-Bowman Rubber Co.; C. E. Hatheway, United States Rubber Co.; Elmo Niccum, Goshen Rubber Co.; and V. Antoine. Mr. Lahey also took first prize for the least number of putts; while second prize was won by J. Allen. Other golf prize winners were: most 5's, John Ward; most 7's, R. E. Johnson, Anderson-Pritchard Oil Co.; most 9's, G. Kraft, Kraft Chemical Co.; lowest score on twelfth hole, J. A. Turner; highest score on ninth hole, C. McLean, American Can Co.; longest drive on tenth hole, Frank Smith, Williams-Bowman; closest to pin on ninth hole, A. L. Myer, Herron Bros. & Meyer; and longest putt on eighteenth hole, Al Berens.

William Fairclough, Enjay Co., Inc., chairman of the arrangements committee, was assisted by John Groot, Dryden Rubber Co.; Otto Hlavacek, U. S. Rubber; Dwight Smith, Cary Co.; R. E. Elliott, Indoil Chemical Co.; Charles Wonder, Van Cleef Bros.; and Clarence Bierman, American Can.

Philadelphia Outing Attracts 130

Some 130 members and guests of the Philadelphia Rubber Group attended its annual outing August 18 at Cedarbrook Country Club, Mount Airy, Pa. The program included a handicap golf tournament, with 60 contestants, card parties, and dinner. Prizes were awarded to the winning golfers, and door prizes were distributed to all at the dinner, through the courtesy of gifts from 61 rubber and supplier companies.

California Group Has Picnic for Members and Families

The Northern California Rubber Group held its annual picnic on August 6 at Tilden Park, Berkeley, Calif. Members and their families attended and enjoyed a day of games for both children and adults, with a picnic lunch at noon. The picnic ended toward evening with the distribution of suitable prizes to game winners. Arthur E. Wolff, B. E. Dougherty Co., was chairman of the arrangements committee and was assisted by Rolla Taylor, United States Department of Agriculture; W. J. Butler, Witco Chemical Co.; and Charles D. Thurmond.

New York Group Plays Golf

Members and guests of the New York Rubber Group were favored with excellent weather and excellent facilities for their golf outing held at the Baltusrol Golf Club, Springfield, N. J., on August 8. About 145 tackled the beautiful Baltusrol Upper Course, and about 160 were present at dinner to applaud the successful contestants for the prizes. A considerable number tried their skill on the putting green; while a few just enjoyed the weather and the scenery, aided now and then by expertly prepared liquid refreshments available on the premises.

First prize for members' low gross went to F. Salamon, Binney & Smith Co.; second prize, to H. Pryor, Synthetic Products Co.; and third prize to J. Breckley, Titanium Pigment Corp. First prize for low gross for the guests was won by W. Curtis; second prize, by L. Sadick, Ross & Roberts; and third prize, by V. Lake, Pioneer Latex & Chemical Co.

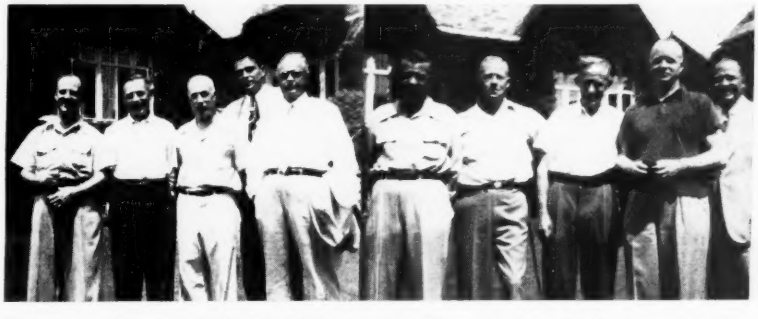
The winner of the kicker's handicap was G. H. McGee, followed by C. White; T. Callahan, Witco Chemical Co.; and J. H. Rines, B. F. Goodrich Chemical Co., in that order.

As a result of his efforts on the putting green, P. W. Reed, Bishop Gutta-Percha Co. won first prize. Second and third prizes were awarded to F. Pechal and K. J. Soule, respectively, both of Manhattan Rubber Division, Raybestos-Manhattan, Inc.

J. S. Corrigall, R. T. Vanderbilt Co., was chairman of the committee responsible for the arrangements for this very successful outing, and he was assisted by Mr. Breckley; E. B. Curtis and A. H. Eufer, also of Vanderbilt; G. W. McComb, Rubber Corp. of America; and Mr. Callahan.

Koresin Tackifier Available

THROUGH the cooperation of the Office of Rubber Reserve and General Aniline & Film Corp., American tire makers will now be able to use koresin to improve the tackiness of synthetic rubber. Koresin was used by the Germans during the war not only to conserve natural rubber, but because a koresin wash was



Among the Participants in the New York Rubber Group Golf Tournament Were *(Left to Right)*: John Raggio, Witco Chemical Co.; Geo. Vogt, Richardson Co.; H. J. Cox, Phelps-Dodge Corp.; Al Beck, a Guest; Geo. Short, Witco; Geo. McComb, Rubber Corp. of America; Jos. Breckley, Titanium Pigment Corp.; Peter Murawski, E. I. du Pont de Nemours & Co., Inc.; and Steven Corrigal and Al Eufer, Both of R. T. Vanderbilt Co.

found to be superior to crude rubber cement in improving tack.

Now being produced in this country by General Aniline, koresin is a condensation product of p-tertiary butylphenol with acetylene. Sufficient tack is produced in milled stock by the use of 5-10% koresin, based on the rubber hydrocarbon. In a gasoline solution for coating the surface of rubber stocks, the optimum koresin concentration is 3-4%. Koresin is not primarily a softener, but is used in addition to the softener or as a partial replacement.

According to data supplied by Antara Products and measured on a newly devised tack tester, the tackiness of a GR-S sample increased from 6-15 ounces when painted with a 4% solution of koresin, and from 12-27 ounces in a sample milled cold with 10% koresin. With only 3% koresin, the tack of the GR-S sample measured 21 ounces. According to the ORR 1945 "Summary Report" on the production and performance of German synthetic tires, the use of koresin in carcass stocks apparently made possible the building of tires without a post-calender dip. In the cementing of plies, the Germans used a Buna stock containing about 10% koresin as the basis for the cement.

Symposium on Instrumentation

THE Agricultural & Mechanical College of Texas, College Station, Tex., will offer its fifth symposium on "Instrumentation for the Process Industries" on October 11-13. The course will be conducted as a seminar with lectures and discussions on the subject of automatic control. Many industrial concerns are cooperating with the College in presenting the course, and manufacturers of instruments and controls are taking part by arranging to show educational exhibits and provide lecturers for many of the sessions. The lectures will cover measurement and control of temperature, pressure, and liquid level, time control, and other allied subjects. The relation between practice and basic control theory will be stressed.

Anyone living either in or outside Texas is eligible to take the course upon payment of the $5 registration fee. Rooming accommodations and meals will be available at the college dormitories and mess hall, and an evening banquet and entertainment are also planned. Further information may be obtained by writing Prof. P. G. Murdock, Chemical Engineering Department.

Forms High Polymer Division

CREATION of a new scientific division of the American Chemical Society, known as the Division of High Polymer Chemistry, has been announced by Society President E. H. Volwiler, Abbott Laboratories. Prof. Carl S. Marvel, University of Illinois, has been elected first chairman of this division, which holds its initial sessions in Chicago, Ill., this month during the Society's national meeting. Prof. Herman F. Mark, Polytechnic Institute of Brooklyn, is secretary of the division, which becomes the twentieth within the Society. The new division is an outgrowth of the high polymer forums held at the Society's semi-annual national meetings since 1946.

CALENDAR

Sept.	14.	Southern Ohio Rubber Group. Engineer's Club of Dayton, Dayton, O.
Sept.	18.	Rochester Section, SPE. Redmen's Club, Rochester, N. Y.
Sept.	19.	Rubber & Plastics Division, ASME. Hotel Sheraton, Worcester, Mass.
Sept.	20.	New York Section, SPE. Hotel Shelburne, New York, N. Y.
Sept.	22.	Chicago Section, SPE, and Midwest Chapter, SPI. Golf Outing. Skycrest Country Club, Libertyville, Ill.
Sept.	26-29.	Industrial Packaging & Materials Handling Exposition, Philadelphia, Pa.
Sept.	28-30.	American Association of Textile Chemists & Colorists. The Wentworth, Portsmouth, N. H.
Sept.	29.	Northern California Rubber Group. Claremont Hotel, Berkeley, Calif.
Oct.	2.	Philadelphia Section, SPE.
Oct.	2-6.	National Hardware Show, Grand Central Palace, New York, N. Y.
Oct.	3.	The Los Angeles Rubber Group, Inc., Hotel Mayfair, Los Angeles, Calif.
Oct.	6.	Detroit Rubber & Plastics Group. Fall Meeting. Detroit Leland Hotel, Detroit, Mich.
		Chicago Rubber Group. Morrison Hotel, Chicago, Ill.
Oct.	11.	Chicago Chapter, SPE, and Midwest Chapter, SPI. Builder's Club, Chicago, Ill.
		Newark Section, SPE. Military Park Hotel, Newark, N. J.
Oct.	11-13.	Division of Rubber Chemistry, A. C. S. Hotel Cleveland, Cleveland, O.
Oct.	16-20.	National Safety Congress and Exposition. Chicago, Ill.
Oct.	17.	Buffalo Rubber Group. Hotel Westbrook, Buffalo, N. Y.
Oct.	18.	New York Section, SPE. Hotel Shelburne, New York, N. Y.
Oct.	18-20.	SPI. Annual Conference. New Ocean House, Swampscott, Mass.
Oct.	19-20.	Technical Association of the Pulp & Paper Industry. Paper-Plastics Conference. New York State College of Forestry, Syracuse, N. Y.
Oct.	20.	New York Rubber Group. Henry Hudson Hotel, New York, N. Y.
		Boston Rubber Group. Somerset Hotel, Boston, Mass.
		Akron Rubber Group. Hotel Mayflower, Akron, O.
Oct.	24.	Association of Consulting Chemists & Chemical Engineers, Inc. Annual Meeting. Shelburne Hotel, New York, N. Y.
		Washington Rubber Group. Hotel Washington, Washington, D. C.
Oct.	27.	Northern California Rubber Group. Claremont Hotel, Berkeley, Calif.
Nov.	6.	Philadelphia Section, SPE.
Nov.	8.	Chicago Section, SPE, and Midwest Chapter, SPI. Builders Club, Chicago, Ill.
		Newark Section, SPE. Military Park Hotel, Newark, N. J.
Nov.	10.	Philadelphia Rubber Group. Poor Richard Club, Philadelphia, Pa.

Rubber & Plastics Division, ASME, Fall Meeting

THE Rubber & Plastics Division of the American Society of Mechanical Engineers will hold two-half-day technical sessions on September 19 at the Hotel Sheraton in Worcester, Mass., as part of the 1950 fall meeting of the parent Society. One of these sessions will be held jointly with the Textile Division in view of the heavy concentration of the textile industry in the New England area.

The titles and authors of the papers for the first session for the morning of Tuesday, September 19, follow: "Dynamic Shear Properties of Rubber-Like Polymers," I. L. Hopkins, Bell Telephone Laboratories, "Comparative Strengths of Some Adhesive-Adherent Systems," Nicholas J. DeLollis, Nancy Rucker, and J. E. Wier, National Bureau of Standards; "Rubber-Phenolic Molding Materials," Wyman Goss, General Electric.

The joint session with the Textile Division on the afternoon of September 19 will hear papers on the subjects of: "Plastics in the Textile Industry," F. P. Hunsicker, Westinghouse Electric Corp.; "Industrial Applications of Nylon Plastics," J. E. Teagarden, E. I. du Pont de Nemours & Co., Inc.

The chairman of the Rubber & Plastics Division is F. W. Warner, of G-E, and secretary is W. Newlin Keen, du Pont.

Kenflex Plasticizer

KENFLEX, a synthetic hydrocarbon resin for use as a plasticizer, is being marketed by Kenrich Corp., 120 Wall St., New York 5, N. Y. Available in both liquid and solid forms, the plasticizer is nonvolatile, highly aromatic, and chemically completely saturated. The material has been shown to have useful compatibility with all elastomers and to be finding increasing use in vinyl insulation, plastisols, and electrical potting compounds, and in various rubber compounds, adhesives, and coatings. In the face of generally rising prices, the company recently announced at 4-7c-a-pound reduction in the price of Kenflex in drum-lot quantities. The plasticizer is made from abundantly available raw materials, and the price reduction was made possible by increased production as the result of expanding commercial use of the material.

Improved Pigmented Latices

BETTER flow-out and greater uniformity and covering power are said to be obtained with organic pigments in polymer latices by the use of Glyceryl (Mono) Ricinoleate S, made by Glyco Products Co., Inc., Brooklyn, N. Y. Good results have been obtained with many copolymer latices, including vinyls, styrenes, and acrylics.

Glyceryl (Mono) Ricinoleate S is used as a wetting and penetrating agent to improve the color uniformity and covering power of the pigmented latices. The material does not cause thickening of the latex as do many other agents used for this purpose. The material is compatible with all the usual latices and plasticizers and actually tends to act as a stabilizer for these products, the manufacturer also claims.

Additional Experimental GR-S Polymers and Latices

ADDITIONS to the list of experimental GR-S dry polymers and GR-S latices, available for distribution to rubber goods manufacturers under the conditions outlined in our November, 1945 issue, page 237, appear in the table printed in the next two columns.

Normally, experimental polymers will be produced only at the request of the consumers, and 20 bales (one bale weighs approximately 75 pounds) of the original run will be set aside, if possible, for distribution to other interested companies for their evaluation. The 20 bales, when available, will be distributed in quantities of one bale or two bales upon request to the Sales Division of Rubber Reserve, or will be held for six months after the experimental polymer was produced, unless otherwise consigned before that time. Subsequent production runs will be made if sufficient requests are received.

These new polymers are experimental only, and the Office of Rubber Reserve does not make any representations or warranties of any kind, expressed or implied, as to the specifications or properties of such experimental polymers, or the results to be obtained from their use.

X-Number Designation	Manufacturing Plant	Date of Authorization	Polymer Description
X-585 GR-S	Copolymer, Baton Rouge	6-9-50	Butadiene/styrene charge ratio 80/20, adjusted to give 16±1% bound styrene on the finished polymer; activated with cumene hydroperoxide or diisopropyl benzene monohydroperoxide, or mixture of both; and polymerized at 41° F. Emulsified with Dresinate 214; shortstopped with DNCB. Mooney viscosity, 46±7. Stabilized with 1.25% PBNA.
X-586 GR-S	U. S. Rubber, Borger	6-14-50	Mixture of 50 parts uncompressed Philblack 0 and 100 parts of polybutadiene. Marasperse and NaOH used in carbon black slurry make-up. Charge formulation: 100 parts butadiene activated with cumene hydroperoxide, polymerized at 86° F. Emulsified with Dresinate 214; shortstopped with DNCB. Mooney viscosity, 25. Stabilized with 1.5% BLE.
X-587 GR-S	U. S. Rubber, Borger	6-14-50	Butadiene/styrene charge ratio 81.5/18.5, adjusted to give 15±1% bound styrene on the finished polymer; activated with cumene hydroperoxide; polymerized at 41° F. Emulsified with Dresinate 214; shortstopped with hydroquinone. Mooney viscosity, 50. Stabilized with 1.25% BLE.
X-588 GR-S	General, Baytown	6-21-50	Mixture of 50±2 parts Philblack 0 and 100 parts of a GR-S polymerized at 41° F. Sodium lignin sulfonate, Dresinate 214, and lignin used in carbon black slurry make-up. Butadiene/styrene charge ratio 75/25, adjusted to give 20±1% bound styrene on the finished polymer; activated with cumene hydroperoxide and/or diisopropyl benzene hydroperoxide. Emulsified with Dresinate 214 and K-ORR soap; shortstopped with DNCB. Shortstopped Mooney viscosity, ML-4, at 212° F., 36±5. Stabilized with 1.5% PBNA.
X-589 GR-S	General, Baytown	6-21-50	Mixture containing 50±2 parts Philblack 0 and 100 parts GR-S-type polymer. Butadiene/styrene charge ratio 75/25, adjusted to give 20±1% bound styrene on the finished unpigmented polymer. Shortstopped Mooney viscosity (ML-1.5 min. at 212° F.), 45±5. Stabilized with 1.5% PBNA.
X-590 GR-S	Copolymer, Baton Rouge	7-5-50	Butadiene/styrene charge ratio 71/29; activated with cumene hydroperoxide, diisopropyl benzene hydroperoxide, Diox 7, or a mixture of these; polymerized at 41° F. Emulsified with Dresinate 214; shortstopped with DNCB. Mooney viscosity, 52. Stabilized with 1.25% PBNA.
X-591 GR-S	Copolymer, Baton Rouge	7-5-50	Butadiene/styrene charge ratio 80/20, adjusted to give 16±1% bound styrene on finished polymer; activated with cumene hydroperoxide, diisopropyl benzene hydroperoxide, Diox 7, or a mixture of these; polymerized at 41° F. Emulsified with Dresinate 214; shortstopped with DNCB. Mooney viscosity, 46. Stabilized with 1.25% PBNA.
X-592 GR-S	U. S. Rubber, Naugatuck	6-28-50	Butadiene/styrene charge ratio 71.5/28.5; activated with cumene hydroperoxide; polymerized at 41° F; Emulsified with Dresinate 731; shortstopped with sodium dimethyl dithiocarbamate. Mooney viscosity, 90. Stabilized with 1.25% BLE.
X-593 GR-S	Firestone, Lake Charles	7-24-50	Butadiene/styrene charge ratio 71/29; activated with diisopropyl benzene monohydroperoxide; polymerized at 41° F. Emulsified with Dresinate 214; shortstopped with DNCB. Mooney viscosity, 55±7. Stabilized with 1.25% PBNA.

Detroit Group to Hear Winkelmann

THE October 6 dinner-meeting of the Detroit Rubber & Plastics Group, Inc., will feature a talk on "Weather Aging of Automotive Rubber" by H. A. Winkelmann, Dryden Rubber Division, Sheller Mfg. Corp. The meeting, to be held at the Detroit Leland Hotel, will also include the showing of color films taken at the Group's summer outing on June 23. Dr. Winkelmann is presently serving as vice chairman of the SAE-ASTM Technical Committee on Automotive Rubber and as chairman of SAE Section IV on Automotive Rubber Classifications.

SPI Programs

(*Continued from page 676*)

Belle, Koppers Co., Inc.; E. D. Kennedy, Monsanto Chemical Co.; S. L. Young, C. F. Church Mfg. Co.; J. T. Moore, Tennessee Eastman Corp.; J. D. Crosby, Hood Rubber Co.; H. A. Jones, New England Tape Co., Inc.; and H. C. Simmons, Jr., Hercules Powder Co.

Plastics Replace Metals

WITH some of the available metal supply being held back for military needs, it is time to begin planning for plastic replacements in such applications as they have proved satisfactory, according to Richard A. Fisch, president of Anchor Plastics Co., New York, N. Y. Mr. Fisch stated that his company has already received orders for extruded channels to be used for tabletop edgings. Although furniture manufacturers normally prefer aluminum for this purpose, they consider plastics a serviceable replacement, with butyrate and ethyl cellulose as the most suitable types. While the latter is superior in dimensional stability, it cannot be extruded with the high gloss of the butyrate.

Mr. Fisch called attention to several other applications where plastics have effectively taken the place of metal, including identification sleeves on fuel, air, and oil lines for aircraft and automotive vehicles, and white polyethylene tubing slipped over metal tubing to replace chrome plating. It was pointed out, however, that even the plastic replacements are often of a semi-essential nature because they themselves are beginning to be in short supply.

MCA Plastics Committees

FOLLOWING the consolidation in June of the Manufacturing Chemists' Association, Inc., and the Plastic Materials Manufacturers Association under the name of the former group, plans are now being developed for all those manufacturers interested in plastics materials to cooperate as an integral group within the newly formed association.

Committees for directing the activities concerned specifically with plastics materials have now been appointed by William M. Rand, president of Monsanto Chemical Co. and board chairman of MCA. These committees are: *plastic steering committee*—D. S. Frederick, Rohm & Haas Co. (chairman); F. N. Williams, Monsanto (vice chairman); J. R. Hoover, B. F. Goodrich Chemical Co.; A. N. Mann, Catalin Corp. of America; M. G. Milliken, Hercules Powder Co.; E. D. Ries, E. I. du Pont de Nemours & Co., Inc.; and J. L. Rodgers, Jr., American Cyanamid Co.; and *resin adhesive subcommittee*—P. A. Macy, Perkins Glue Co. (chairman); C. J. Romieux, American Cyanamid; and E. E. Decker, Monsanto.

SPE Prize Paper Contest Judges

JUDGES for the 1950 Prize Paper Contest of Society of Plastics Engineers, Inc., have been announced by Henry M. Richardson, of DeBell & Richardson, Inc., and chairman of the contest. Gerald H. Mains, National Vulcanized Fibre Co., will be chief judge and will be assisted by Albert G. H. Dietz, Massachusetts Institute of Technology; R. G. Chollar, National Cash Register Co.; Carl J. Frosch, Bell Telephone Laboratories, Inc.; and J. C. Reinecke, Miles & Reinecke, Inc.

The only requirements for papers in the contest are that they be of interest to the plastics industry, have not been previously published, and are submitted to a local section of the Society by November 15. Many local sections are awarding prizes to winning papers, and papers entered in the national contest will compete for three prizes of $200, $100, and $50, respectively. The three winning papers will be presented at the Society's forthcoming National Technical Conference on January 18-20 at the Hotel Statler, New York, N. Y.

RUBBER WORLD
NEWS of the MONTH

Rubber Consumption Roll-Back Planned; More Synthetic Rubber Plants to Be Reactivated

In addition to the synthetic rubber plants ordered reactivated on July 7, all government synthetic plants except the 90,000-ton Institute, W. Va., copolymer plant and the alcohol-butadiene plants at Louisville, Ky., and Kobuta, Pa., were included in the stepped-up synthetic rubber production program by virtue of an order from W. Stuart Symington, chairman of the National Security Resources Board, on July 28. The proposal of The Rubber Manufacturers Association, Inc., to make more natural rubber available for the government's strategic stockpile by ordering consumption of new rubber reduced by approximately 20,000 tons a month, beginning September 1, was favorably received by government officials and rubber traders. An order implementing the RMA proposal, but including some modifications was expected before September 1.

The rubber industry seemed reasonably well prepared for economic mobilization of either limited or of the fairly complete type. John L. Collyer, of The B. F. Goodrich Co., asked that nations that control, or have influence in the rubber producing areas of the Far East, discontinue the sale of crude natural rubber to Russia and its satellites.

Rubber goods production records continued to be broken in most lines, but the very high natural rubber prices of the last two or three months forced further price increases for tires and other rubber goods.

The United Rubber Workers of America, CIO, asked the Big Four rubber companies to negotiate with them for another round of wage increases. It was reported that a 25¢-an-hour general increase would be asked together with an additional 6¢-an-hour in some cases to correct wage and area differentials. Bargaining on a Big Four basis was requested by the union, but was unlikely of realization. Goodrich, whose reply to the union was due August 13, was arranging for a place and time for meeting with union representatives, according to a report from a company spokesman on August 18.

Symington-Munitions Board July Report

NSRB Chairman W. Stuart Symington told Congress on July 24 that "the rubber situation is in pretty good shape," but said the government should buy "a good deal more" natural rubber.

"I would like to see us buy several hundred thousand more tons of natural rubber," he said, in giving his "personal" opinion.

Symington made the statements in appearing before the Senate Banking & Currency Committee to describe how the administration will use the allocation and inventory control authority asked by President Truman a week earlier.

His comment that the "rubber situation is in pretty good shape" came during a discussion of where these controls might be applied. He added that there are "definitely some others" which would have to be controlled immediately. He cited nylon, steel, aluminum, copper, lead, and zinc—but not rubber—as such commodities.

Symington also declared that the government is now operating or planning to operate "over half our synthetic rubber capacity."

He made these statements in response to questions by Sen. John Bricker of Ohio.

The following day the Defense Establishment's Munitions Board, in its semi-annual report to Congress on the stockpiling program, called for acceleration of procurement, warning that otherwise "completion of an adequate stockpile will be dangerously deferred."

The natural rubber stockpile schedule for fiscal 1950 was "not met," it was said.

It also reported that the Economic Cooperation Administration expects soon to be purchasing blocks of rubber — using Netherlands 5% counterpart funds. During the year ending June 30, 1950, ECA made purchase commitments for the stockpile amounting to $13,112,085, and these purchases included rubber as well as six other materials.

The report also covered the heavy rotation of the natural rubber stockpile, possible development of greater natural and synthetic rubber production, and research to eliminate the need of natural rubber in heavy-duty truck tires.

It said: "Political and economic conditions in principal producing areas discourage expanded investment on new plantations—particularly in the case of rubber, which requires eight years between planting and the first harvest. Expanded production of rubber in other areas, such as South America and Africa, is a difficult and long-range operation and probably would require heavy subsidization to achieve substantial results.

"Accordingly, the only remaining solution other than reduced consumption is by increasing production of synthetic rubber. This synthetic production could then replace natural rubber in many industrial uses, thereby increasing the availability of natural rubber for the stockpile. Steps taken at the close of the fiscal year 1950 to reactivate synthetic rubber plants are in support of this policy."

With respect to research activities, the report said: "Activities are now under way, under the auspices of the Reconstruction Finance Corp. and with support by the Department of Defense, to eliminate the requirement for natural rubber in heavy-duty truck tires; if successful, these steps would ultimately reduce much of the nation's strategic dependence upon natural rubber. Accelerated research in production of synthetic rubber is also needed to improve the product and to reduce its cost."

The report gave no specific figures on the rubber stockpile.

August Mobilization Action

In August the government entered upon the second phase of readying itself for stepped-up military preparedness in rubber.

Planning of the first phase, i.e., increasing synthetic rubber production, as indicated above, was largely completed in July with White House orders to the RFC to reactivate all stand-by rubber and feedstock plants, except the 90,000-ton Institute, W. Va., copolymer plant and the alcohol-butadiene plants at Louisville, Ky., and Kobuta, Pa. By early 1951, government synthetic rubber output should be up to a 675,000-ton annual rate, including 600,000 tons of GR-S.

At a meeting with government rubber officials on August 11, the RMA's national security policy committee, which has spearheaded all recent rubber mobilization planning, proposed that the Institute plant be readied for production if and when required, that similar steps be taken for the alcohol-butadiene plants, and that the government build up a working inventory of synthetic rubber.

It was at that meeting, following a two-day session of the industry executives in Washington, that the RMA formally proposed a plan for making more natural rubber available for the government's strategic stockpile. All indications pointed to ready acceptance of the proposal, with possible modifications, by the government. Details were to be worked out at a meeting of the Rubber Industry Advisory Committee of the Department of Commerce's Rubber Division on August 18.

The RMA proposed that, effective September 1, the government order consumption of new rubber reduced by approximately 20,000 tons a month. It recommended that this curtailment be accomplished by amending Commerce Department Order R-1 to limit monthly consumption by each consumer to his average monthly consumption in the year ended June 30, 1950.

In this 12-month base period the industry used an average of 90,000 tons of new rubber a month, about 20,000 tons less than the July and August monthly consumption rate.

The industry proposal did not single out natural rubber for special treatment. This was avoided in order to avert hardship to consumers using relatively higher proportions of natural rubber during the base period than used by competing consumers. The RMA proposal relied, instead, on the far lower price of synthetics to lead consumers to take all—or nearly all the cutback in natural rubber.

Initial reaction from rubber traders and the producers' spokesman, the Natural Rubber Bureau, was also favorable. The trade was expecting more drastic action—steps such as product specification control for natural rubber which has been receiving consideration in the Commerce Department, but apparently is being held in abeyance in the event the simpler, indirect type of action proposed by the RMA does not result in freeing natural rubber for stockpiling, or if the entire mobilization program is expanded beyond immediate goals indicated by the President.

The rubber products industry reportedly assured government representatives at the August 11 meeting that the proposed cutback would still leave ample tire production to maintain normal requirements for vehicles now on the road.

The industry proposal, far less complicated than a return to wartime product specification controls, would achieve the same objective of freeing natural rubber for

stockpiling with a minimum of adverse psychological impact on a panic-buying public, whose hoarding of tires, reflected in consumption of new rubber, is of deep concern to both manufacturers and government officials charged with mobilization preparedness.

The Commerce Department, expecting broad allocation and priority powers in the general mobilization bill from Congress, powers some government attorneys doubt are in the Rubber Act of 1950, had pursued its preliminary spadework on product specification control to the extent of setting its Rubber Industry advisory technical subcommittee to work determining just how little natural rubber could be used in various types of tires, primarily passenger-car tires, without impairing quality.

Rep. Carl Durham (Dem., N. C.), chairman of the House Armed Services stockpiling subcommittee, said early in the month, before the RMA proposal was made known, that he thought the government might eventually have to resort to a product specification control limiting natural rubber consumption in order to free more for the stockpile, for which recent accumulations have been small. He said the natural rubber stockpile was far behind schedule. Earlier, Durham had sharply criticized the General Services Agency's buying policy for natural rubber stockpiling as too limited and too slow. GSA thereupon adopted a more flexible policy of buying all grades but the very lowest.

The Natural Rubber Bureau, representing producers of natural rubber, estimated in its August newsletter that the proposed cutback order will still find 1950 United States consumption of new rubber at an all-time record high of 1,170,000 tons, including 598,116 tons in January-June inclusive, 212,000 tons in July and August, inclusive, and 359,452 tons in the final four months. It commented further as follows:

"With such a limitation of consumption excesses, and with an enormous synthetic production in the making, the stockpiling authorities can finally put a major 1951 program into operation. At least 1,000,000 tons natural is required to fight a four-year war in this 1950 era, and we should not end a war with zero stocks of natural. Whereas in the last war we could get along on a pattern of about 15% natural to total consumption, now we require more nearly 25%. High flotation tires, larger rim diameters, etc., have made natural more vital than ever before. Not to step up the stockpiling pattern, in these uncertain times, would be unthinkable.

"In 1951 the U. S. Government, by its decisions on synthetic production, consumption limitation and stockpiling, will be the dominant factor in the rubber market. As we see it, a wise administration of that responsibility can assure what is universally desired—a stable market at fair prices. The 1950 boom does not mean a 1951 doom for natural rubber. Everyone recognizes that the producing industry did not engineer the 1950 shortage. But Washington is determined to stop another serious price spurt, and any return of prices to July peaks would almost certainly see a return of government buying at fixed prices, and far more stringent consumption restrictions."

Two Senators in the forefront of last month's Congressional squabble over how much control over the economy should be authorized at this time voiced strong objections to government sale of surplus synthetic rubber plants and other surplus facilities of military value.

Sen. Lyndon Johnson (Dem., Tex.), chairman of the recently established Senate war investigating committee, stopped the pending sale of the Akron, O., copolymer plant to The General Tire & Rubber Co., which had entered low bid for the 30,000-ton plant, repeatedly put up for sale since the war.

Johnson, in a closed meeting with the Secretaries of the Air, Army, and Navy, warned them to stop selling World War II surplus property at "cut-rate" prices. He was particularly concerned with Army Surplus Stores offering a variety of military goods at low prices—including equipment of present value in training military forces.

Senator Johnson also revealed that he had written Defense Secretary Louis Johnson asking for a prompt report covering these points:

1. What is present government surplus policy, what plants and other property has been sold to date;

2. What steps can be taken to recapture sold and leased plants and property for the government; and

3. Complete revision of the present surplus policy, adopted five years ago in a period of demobilization. The Senate committee, constituted as a "watchdog" over military mobilization, asked that a more "realistic" policy be adopted to take account of current military mobilization programs.

On August 16, Sen. Wayne Morse (Rep., Oreg.), the Senate's leading advocate of stringent all-out controls, called for a "thorough investigation" by Congress of sales of usable military surpluses. Morse, in a Senate speech, suggested that the proposed sale of the Akron synthetic rubber plant to General Tire would be a good "starting point" for the inquiry.

Morse, a member of the Johnson "watchdog" committee, disclosed that the sale to General Tire was halted on orders from Mr. Symington. Whether the committee will actually formally investigate the negotiations for the plant is problematical.

Chairman Johnson said that he thinks Symington's order accomplished the present objective which is to keep "potentially" useful plants in government hands. Johnson has not suggested that the Akron plant be reactivated at this time, but only that it not be sold, particularly under conditions imposing no guarantee that it would be kept in readiness for addition to the nation's synthetic rubber program, when and if needed.

General Tire Reply on Plant Bid

In an open letter advertisement in Washington's three Sunday papers, William O'Neil, president of General Tire, "set the records straight" on his company's recent effort to purchase a surplus synthetic rubber plant in Akron.

Headlined, "We Want to Set the Record Straight, Mr. Drew Pearson," the advertisement pointed out:

"On Mr. Drew Pearson's radio time over the American Broadcasting Co. network last Sunday night (August 6), some unfair innuendoes were directed at The General Tire & Rubber Co.

"By inference, some government officials were also unfairly hurt. Perhaps these innuendoes and inferences should be ignored. Cold type is no match for hot air in the vaporous realm of insinuation. But this is the only means we have to state the facts and let them defend us among those who will take the trouble to read them.

"Over the air, such phrases as 'questionable sale'—'bargain sales'—and 'the deal was all set'—made it sound as if The General Tire & Rubber Co. had somehow connived to purchase, for less than its value, a synthetic rubber plant from the government and turn it over to the production of plastics. It was implied that these plastics were somehow frivolous and less than essential," it was explained.

Reviewing the deal's history, Mr. O'Neil recounts the following facts:

"The plant in question has been idle and deteriorating for five years.

"It was the first rubber plant to be shut down and was not deemed modern enough to be kept in stand-by condition.

"It has been 'cannibalized' to the extent of about 25%, by equipment transfer and sales.

"The plant has been on the government surplus list for more than a year.

"General did not initiate negotiations for the purchase, but was invited to bid.

"General's bid of $2,214,000 was 65% above the government's own fair value estimate of $1,375,000 and far above other bids.

"General offered to place the plant in position to make synthetic rubber in five months by spending $75,000.

"General also agreed to convert to synthetic rubber immediately upon notice of the government.

"Moreover, General offered to give the government the option of repurchasing the plant at actual cost at any time without profit whatever to General.

"The plant is not capable of producing 30,000 tons of synthetic rubber annually, as reported on the Pearson program. It is in no position to produce any.

"Finally, the plastic which Mr. Pearson's program looked upon with such suspicion is a new type needed right now for a number of emergency military purposes, some of which are strictly confidential."

Concluding his statement, Mr. O'Neil observed: "These facts, in contrast with the quick cynicism of the broadcast, constitute a good case history of how diligent capable parties—in government and industry—can be harmed by half-truth reporting of complicated matters."

Humphreys and Collyer Mobilization Comments

H. E. Humphreys, Jr., president, United States Rubber Co., took part in a program of the National Association of Manufacturers over the ABC network August 14, entitled "Industry Mobilizes—A Report to the People." The purpose of the NAM broadcast was to present a report of industry's readiness and capacity to meet civilian and defense requirements, which information might serve as a basis to restrain hoarding and inflation. With regard to the rubber industry, Mr. Humphreys said:

"The rubber industry's job today is to produce what our country needs for defense as well as for civilian purposes. And I'm happy to report that today we are in much better shape to do this job than ever before. Let me give you three reasons why:

"First, our raw materials situation is better.

"When World War II started, we had only one raw material. That was natural rubber, and we didn't have much of it on hand. Moreover, we were soon cut off from 90% of our supply. Today, we have not one but two raw materials—natural rubber and synthetic rubber. We have them both in reasonable amounts. And if the supply of natural rubber should be reduced, it is reassuring to know that the supply of synthetic rubber is getting larger every day.

"Second, our production capacity is larger.

"Before World War II our industry could turn 85,000 tons of rubber into finished products each month. Now, we can process 110,000 tons a month. This is an increase of almost one-third in our production capacity.

"Third, we have more workers, and they have more know-how.

"Before World War II, our industry had about 150,000 wage employes. Today, we have over 200,000. Before World War II the people of our industry were used to working only with natural rubber. Now, they have learned how to handle synthetic rubber. They have improved it so much—made it so good—that you can't tell whether you are riding on natural or synthetic.

"The rubber industry stands ready, willing and able to serve our nation as it strives to keep our civilian economy strong, and as it fights to keep men free. You can help by buying rubber products in normal quantities—by buying only what you need."

John L. Collyer, Goodrich president, in a mid-August statement, asked that nations that control or have influence in the rubber producing areas of the Far East discontinue the sale of crude natural rubber to Russia and its satellites.

"Crude rubber, a vital strategic material, is being received in diminishing tonnage in the United States although this nation is the world's largest consumer of rubber of all types. Meanwhile, Russia has been buying substantial quantities of natural rubber since the close of World War II," Collyer declared.

"Principal supplier of rubber to Russia has been and continues to be British Malaya and Indonesia and other producing areas also unquestionably supplying rubber for stockpiling and consumption behind the iron curtain.

"It is significant that nations controlling 80% of the world's crude natural rubber are either beneficiaries of the Marshall Plan or are today receiving American aid through governments that are sponsored by the United States.

"These nations are standing with the United States in the action of the United Nations in Korea and have pledged moral, and to some extent, material assistance to our nation and our armed forces in this present war against communism.

"Recent statistics on the distribution of natural rubber show, for example, that in July of this year only 27,000 tons of the 102,000 tons shipped from Malaya came to this country. Our country, which normally consumes 55% of the world's new rubber, received 55% of Malayan rubber in 1940 before World War II and 37% for the first six months of the current year. The July, 1950, figure of only 27% emphasizes the urgency of our present rubber position.

"The United States, at the present rate of consumption, will this year require approximately 1,200,000 long tons of new rubber to fill military and essential civilian requirements, including both natural and synthetic rubber.

"Due to our nation's present inability to obtain natural rubber in sufficient quantities for necessary stockpiling and continue to fill the legitimate needs of American consumers, it may be mandatory for government to exercise controls on rubber usage. Diversion of rubber supplies from Russia to the United States would be in the highest interests of all free peoples at this critical period.

"On the economic side Russian purchases of natural rubber are largely paid for in the soft currencies of the countries concerned. Nations engaged in natural rubber production would improve their dollar position through the sale of additional supplies of natural rubber to the United States while, at the same time, making a definite contribution to their own security and to ultimate victory in Korea. Such dollar earnings would lessen the drain on American taxpayers, and make more of our financial resources available to win the war."

Industry Production and Trends

Production of passenger-car tires continued at a record pace in June, with 7,310,890 units made against the May record of 7,369,190, according to the regular monthly report of the RMA of August 8.

Manufacturers' shipments of passenger-car tires to dealers and auto manufacturers rose 21% in June to 8,804,091 units, against May shipments of 7,276,860 tires. Despite these record shipments there still remained in manufacturers' inventories 8,987,234 tires on June 30.

Truck and bus tire production during June was reduced 7.2% to 1,169,376 units from 1,259,897 units in May. Shipments of truck tires continued high, however, amounting to 1,398,120 units, an increase of 12.4% over May, when 1,244,281 tires were shipped. Manufacturers' truck tire inventories declined 11.4% to 1,774,829 units from the 2,002,692 held at the end of May.

Production of automotive tubes rose 6.3% in June to 7,536,925 units, compared with 7,089,327 in May; while shipments rose 26.5% to 8,458,809 tubes, against 6,687,925 the month before. Manufacturers' tube inventories declined 7.1% to 11,248,213 units from 12,109,933 on May 31.

Current orders for belting are reported as equaling those of the 1948 peak year after the 1949 slump. Backlogs for this branch of the industry are also nearing 1948 proportions, and delivery dates are getting further into the future.

Spokesmen for leading belt makers such as Goodyear Tire & Rubber Co., U. S. Rubber, Goodrich, Hewitt-Robins, Inc., the Manhattan Rubber Division, Raybestos-Manhattan, Inc., Boston Woven Hose & Rubber Co., Thermoid Co. and Lee Rubber & Tire Corp., report a terrific demand, 20 to 30% greater than for the comparable 1949 period. New and expanding uses for conveyer belting include iron ore fields, paper-making wood pulp mills, and food processing plants.

Demand for automotive and aircraft rubber parts continues at peak by virtue of record automobile production and accelerating aircraft manufacture. This demand also includes hard rubber products and matting.

The rubber footwear industry was one field where no production peaks were being achieved since two open winters and the lack of early orders for the coming fall and winter season have kept manufacturers at a lower than normal production rate.

In the toy field, orders are reported by one large manufacturer, Ideal Novelty & Toy Co., as being 167% above those for a similar period last year. The World War II baby crop was the reason given for this larger market. Ideal will hit its production peak earlier and maintain it longer than ever before, it was said.

David Rosenstein, president of Ideal, said that from the 1950 Toy Fair orders and those which have come in since, his own company, which did about $11,000,000 worth of business in 1949, may reach a $15,000,000-figure this year, if war-induced curtailments and restrictions do not hit too hard.

United States exports of rubber and rubber products were valued at $42,195,536 in the first six months of 1950, a 36.2% decline from the $66,108,567 worth exported in the same period of 1949, the Department of Commerce reported on August 16.

Exports in June this year were valued at $7,551,258, compared with $6,661,923 in May, and $10,102,419 in June, 1949. The June figure was the highest this year, but lower than in any month in 1949 except November.

Review of Bureau of Census statistics shows that among major categories of domestic exports, reclaimed rubber has joined synthetic rubber in exhibiting a gain over 1949 figures. Off-the-road tires and the "all other" category have also held up well, declining less than 5%. Losses in other categories ranged from 9.9% (rubber thread, cement, etc.) to 65.2% for scrap rubber. Most of the decline in exports during the first half of 1950 can be traced to shipments of transportation goods (tires, tubes, camelback, and tire repair materials) which dropped 45.5%—from $43,017,651 to $22,903,903.

U. S. imports of rubber and rubber products were valued at $157,639,438 in the first six months of this year, up 16.8% from the $135,000,248 reported in the like period of 1949. Categories other than natural rubber showed much larger percentage increases than natural rubber in the 1950 period, but natural rubber still accounted for 94.7% of the total in the 1950 period, compared with 96.6% in the 1949 period. The average declared value per pound of natural rubber imports was 17.1¢ in the 1950 period, as against 17.3¢ in the 1949 period, but this value had risen from 15.2¢ in January to 19.4¢ in June and will rise further in coming months, the Commerce Department report said.

The Department of Commerce analysis of June rubber consumption figures confirmed that a new all-time record of 111,012 tons of new rubber had been used and that the consumption total for the first six months of 1950 also reached a new high, 598,116 tons, up 17.3% from the 509,961 tons reported for the corresponding period of 1949, and even higher than the 1947 first half year record of 571,984 tons.

Consumption of all domestic synthetic rubber increased in June over May. Consumption of GR-S at 34,265 tons was the highest since 1947. Meanwhile GR-S production increased from 26,549 tons in May to 30,146 tons in June, but even at this figure was more than 4,000 tons less than consumption.

Natural rubber consumption, including latex, declined 899 tons to 62,914 tons in June. In the first six months of this year, natural rubber use averaged 60,345 tons per month, a figure exceeded only in 1941 when consumption of synthetic rubber was very small. Stocks of dry natural rubber available to industry declined 1,073 tons to 95,572 tons at the end of June.

For the fourth time this year monthly consumption of new rubber in the non-transport segment set a new record, reaching 37,647 tons in June, well above the previous high of 35,212 tons registered in May. Total natural rubber consumption in this segment reached a postwar high of 20,392 tons, up 926 tons from May. GR-S consumption also jumped 1,094 tons to 9,704 tons, and the non-transport segment accounted for 33.6% of total U. S. new rubber consumption in June, against 31.9% in May, and 30.5% in June, 1949.

According to the monthly report of the RMA, rubber consumption in July dropped 6.75% to 103,524 tons from the 111,012 long tons used in June. Shutdowns in plants for vacations and maintenance work, although fewer in number than a year ago, accounted for a substantial portion of the decline, it was said.

Consumption of natural rubber in July amounted to 60,108 long tons, a reduction of 4.5% from the previous month, when 62,914 tons were consumed. Synthetic rubber consumption dropped to 43,416 long tons from 48,098 long tons in June, a reduction of 9.7%. By types the synthetic rubber consumption in July was as follows: GR-S, 33,734 tons; neoprene, 2,868 tons; Butyl, 5,305 tons; and nitrile types, 1,509 tons.

For the first seven months of this year 422,180 long tons of natural rubber were consumed, against 331,282 long tons for the same period of 1949, an increase of 27.4%. Total synthetic rubber consumed in the same seven months' period amounted to 279,460 long tons, against 250,377 long tons the year before, an increase of 11.6%.

Tire and Other Price Increases

For the third time in as many months the prices of tires and tubes were again raised by most manufacturers of these products. This third round of price increases was initiated by General Tire, which raised the prices of all truck tires by 7½%, and all passenger and farm tractor tires by 5%, on August 1. Natural rubber tubes of 11.00 and smaller cross-sections with natural rubber construction both passenger and truck, were increased 20%. Tubes with 12.00 and larger cross-sections with natural rubber construction were increased 10%.

Announcing the new prices in a letter to General's dealers, L. A. McQueen, General vice president, said:

"Practically everything we buy today that goes into the manufacture of finished goods is substantially higher than it was a month ago.

"For example, in the last month our rubber costs have increased well over 50%, and they are almost three times the price of natural rubber a year ago—the highest since 1927. Our fabric costs have increased almost 5%, and our carbon black costs are up nearly 10%.

"No one knows what the next several weeks will bring in raw material costs, but we can assure you that no further advances will be made in list prices or distributor costs unless they are forced upon us as they have been the last several weeks."

Goodyear, Firestone Tire & Rubber Co., and Lee on or about August 5 also announced a similar 7½% increase in truck and bus and 5½ increase in passenger-car tire prices, explaining that the rise was due to higher costs of natural rubber and other materials. Goodyear also raised the price of natural rubber inner tubes 30%; while Lee raised the price of these tubes from 10 to 20%.

Seiberling Rubber Co. raised tire prices from 5% to 7½% on August 7 and also raised the price of natural rubber inner tubes 20%.

Goodrich raised passenger-car tire prices from 5 to 10% and truck tires 7½ to 15% on August 10. Farm tractor tires were increased in price 5%, and natural rubber inner tubes 20%. U. S. Rubber on the same date raised prices of tires and tubes about the same amounts given for Goodrich. Firestone then adjusted its tire and tube prices to the new higher level.

Prices on belting and hose and many mechanical goods items were raised on or about July 25 because of higher rubber and other material costs. Business in this field was reported as near peak levels again after the 1949 slump.

World Rubber Production and Consumption

World production of natural rubber reached 157,000 long tons in June, the highest monthly figure ever recorded, according to estimates of the Secretariat of the Rubber Study Group, the U. S. Department of Commerce said on August 14. Output of natural rubber in June exceeded consumption by 20,000 tons.

For the first six months of the year, production was estimated at 822,500 tons, which was 125,000 tons, or 17.9%, greater than in the corresponding period of 1949. Normal seasonal factors point to an annual output for 1950 of more than 1,700,000 tons.

Rubber exports from Indonesia in June were calculated by the Secretariat at 65,631 tons, only 77 tons short of the all-time record posted in September, 1941. For the first half of 1950 these exports totaled 275,551 tons, an increase of 89,333 tons, or 48% over January-June, 1949 figures. If the monthly figure of 65,000 tons for exports from Indonesia is maintained for the remainder of 1950, a total of 650,000 tons, well above the 520,000-ton annual output estimated by the Secretariat in May, might be achieved.

Rubber production in Malaya, Sarawak, and British North Borneo also has been stimulated by higher prices. At present rates Malayan production this year is headed toward a figure approaching the 698,189 tons produced in 1948.

Continuing the record pace of the previous month, world new rubber consumption was again estimated at 190,000 tons in June, and consisted of 137,500 tons of natural and 52,500 tons of synthetic. The synthetic figure was the highest since May, 1947. For the June half this year, new rubber consumption was estimated at 1,047,500 tons (792,500 natural, 255,000 synthetic), as against 970,000 tons (732,000 natural, 237,500 synthetic) in the same period last year. Included in these consumption figures are estimated imports of natural rubber into Russia amounting to 5,750 tons in June, 27,500 tons in January-June, 1950, and 67,500 tons in January-June, 1949.

Synthetic rubber production in June was estimated at 43,500 tons, making the January-June total about 230,000 tons, as compared with 235,633 tons in the same period last year.

World stocks of natural rubber, excluding Russian stocks, and excluding government stocks in the United States, the United Kingdom, and France, were placed at 715,000 tons as of the end of June, down 10,000 tons from January 1. Stocks in consuming countries were estimated at 247,500 tons, down 12,500 tons from January 1. World stocks of synthetic rubber were estimated at 75,000 tons, down 35,000 tons since the beginning of the year.

Rubber Roads

The first commercial sale of rubber for roads in this country was made in August to the city of Baltimore, Md. The city bought five tons of natural rubber powder and in the week ending August 19, used it in the binder and top surface of an 1,800-foot stretch of four-lane highway at Falls Rd, at Belvedere St. in that city. The rubber was sold by Baker-Meekins Co., Baltimore.

The 1,800-foot strip is the largest test strip yet laid down with natural rubber in this country. Military officials expressed interest, indicating they will keep careful watch on its performance to ascertain the possibilities of rubber powder for military road paving, including airstrips.

The Natural Rubber Bureau, which has promoted this use of rubber in America, indicated that future operations for several years will be pretty much confined to laying strips for experimental purposes, rather than pressing the commercial possibilities of rubber for roads. Many communities throughout the country have expressed interest in laying test strips in response to the Bureau's promotion of this use for natural rubber. Many apparently will have to wait.

Natural Rubber Bureau Program

As it enters its second year in 1951, the Natural Rubber Bureau will make some significant changes in its natural rubber promotion program in this country.

Details were now being worked out with officers of the parent organization, the British Rubber Development Board, in London, last month. The broad outline of the 1951 program will carry these changes, it has been reported:

A de-emphasis of promoting non-military uses, with abandonment, temporarily, of promotion of foam rubber products.

Abandonment of advertisements promoting the advantages of natural rubber vis-a-vis synthetic rubber.

The 1951 program will emphasize the role of rubber in national defense, particularly military equipment. The bureau will accelerate its experimental research efforts for military applications of natural rubber.

In general, the Bureau plans to key its program to the rubber producers' role in America's stepped-up military defense program.

FTC Standard Oil Complaint

The Standard Oil companies of Ohio, Kentucky, California, Indiana, and New Jersey and Atlas Supply Co., which they control, were charged by the Federal Trade Commission, on July 26, with monopolistic practices in the purchase and resale of tires, batteries, and other automobile accessories generally known as "TBA" products. The three-count complaint alleges conspiracy to restraint of trade and unlawful receipt of brokerage fees and price discriminations, in violation of both the Federal Trade Commission Act and the Clayton Anti-Trust Act.

One count of the complaint charges combination and conspiracy "to monopolize trade in the purchase, sale and distribution of 'TBA' products in interstate commerce," in violation of the Federal Trade Commission Act. The complaint says that the companies "have agreed and conspired among themselves to purchase the said commodities at illegally discriminatory prices and to receive illegal commissions, brokerage or other compensation . . ."

According to the complaint, Atlas was organized in 1929 by the Standard companies, "acting in concert," and it has been "managed, controlled, and operated" by them "to serve as a medium or instrumentality by, through, or in conjunction with which said 'Standard Oil Companies' exert the influence of their combined purchasing power on their vendors of 'TBA' products."

Practices said to have been engaged in by the respondents pursuant to their combination and conspiracy are listed as follows: (1) Directing the attention of sellers to the purchasing power possessed by them acting in concert and, on this ground, demanding and receiving discriminatory prices, discounts, allowances, rebates and terms and conditions of sale on their individual purchases. (2) Replacing sellers who would not accede to such demands with sellers who did. (3) Entering into contracts whereby sellers agreed not to sell to Standard-Atlas competitors at prices lower than those charged Standard-Atlas. (4) Applying part of the savings obtained by these illegal purchasing methods "to finance a very large and effective merchandising and sales promotional organization." (5) Passing on to the Standard companies, in the form of dividends on Atlas common stock, rebates on purchases made through Atlas. (6) Agreeing among themselves not to compete in the resale of commodities purchased through Atlas, with the Standard companies carrying out a "planned common course of action" whereby each sold, in mutually exclusive areas, commodities purchased through Atlas."

These practices, according to the complaint, have increased substantially the size, power, and market control of the respondents and have tended to create a "monopolistic power in purchase and resale of 'TBA' products." They have not only eliminated competition between Standard companies in the resale of products purchased through Atlas, the complaint states, but have also injured, lessened, prevented, and destroyed competition in the resale of "TBA" products between the respondents and other oil companies and distributors, wholesalers, and jobbers.

The combination has also resulted in foreclosing a large market to manufacturers and other sellers who refuse to grant illegally discriminatory prices or to pay illegal brokerage, the complaint further declares.

Commodities in which the respondents' percentage of total sales has "tremendously increased" include tires, tubes, batteries, fan belts, radiator hose, electric lamps, and spark plugs, the complaint asserts. As a matter of fact, it says, the Standard companies, purchasing collectively through Atlas, are now one of the largest, if not the largest, buying units in the U. S. purchasing these commodities for resale. Their sales of each of these items purchased through Atlas has increased from a negligible amount prior to 1929 to 10%, more or less, of the total replacement sales made in the United States, it was stated.

The complaint cited transactions with certain supplier companies as evidence of violation of the Clayton Act in that they may be assumed to have substantially lessened competition and tend to create a monopoly.

Twenty days was allowed the respondents to file answers, and the first hearing is scheduled in New York, October 16, before Trial Examiner Everett F. Haycraft.

The complaint shows Commissioner William A. Ayres as not participating.

Labor Relations News

Following the Columbus, O., meeting of the international policy committee of the United Rubber Workers of America on July 25 and 26, Goodyear, Firestone, and U. S. Rubber were notified by the union that it wanted to begin negotiating another round of wage increases. Goodrich, the other Big Four company, had been notified on July 13, and its reply was required within 30 days by terms of its contract with the union.

It was reported that union delegates at the Columbus meeting were agreed almost unanimously that the union must demand about a 25¢-an-hour wage increase because of "rising living costs, increased man-hour production, and the general economic conditions prevailing today." In addition, the union is asking 6¢-an-hour more to correct wage and area differentials and inequities.

At the same time the union is including in its wage increase demands, more than just a general wage increase for thousands of maintenance workers, machinists, electricians, and other craftsmen who do not take home the average paid to less skilled workers whose earnings are boosted by the incentive system.

The union is also desirous of bargaining on a Big Four basis, which was abandoned in 1948. It is not likely that all the companies will agree to bargaining on a Big Four basis. If one refuses, then the union will tackle the companies individually, bargaining on a company-wide level.

L. S. Buckmaster, president of the URWA, advised against labor-management contracts running longer than one year. He believes the present world picture is changing, and long-term contracts may be unwise.

Negotiators for Seiberling and the URWA signed a pension and welfare program and a one-year extension of the company-wide contract with amendments on August 1. The pension and welfare program includes $100 a month minimum pensions for 65-year-old workers with 25 years' service, and modified disability retirement features that pay $50 monthly to workers 60 years or older who have worked for Seiberling for 15 years.

Other provisions include $1,500 company-paid life insurance and accidental death or dismemberment benefits; improved jointly paid sickness and accident benefits, paying $20 to $35 weekly for 13 weeks; hospitalization for the worker and dependents of $7 daily for 31 days. Also included is $70 for miscellaneous hospital expenses and up to $200 for surgical benefits. The pension agreement includes a severance pay clause, providing payment of 2% of an employe's gross earnings after five years' service. The pension pact runs five years.

About 3,500 production workers at U. S. Rubber's plant in Mishawaka, Ind., were on strike during the first week in August because of a dispute involving job merit systems for older employes.

Another U. S. Rubber plant, this one in Passaic, N. J., also had a wildcat strike between August 10 and 15 because of a dispute involving job assignments. The local union contract expired on August 22, and contract negotiations were being continued.

3M Expands in Atlanta

Plans for the construction of two adjoining buildings for warehouse and sales office space in Atlanta, Ga., have been announced by Minnesota Mining & Mfg. Co., St. Paul, Minn. According to C. P. Pesek, vice president in charge of engineering, both units are expected to be ready for occupancy about January 1.

The one-story structures will have a total floor area of 12,500 square feet. The warehouse building, larger of the two, will cover 10,000 square feet with outside dimensions of 100 by 100 feet.

The office building, measuring 41 by 61 feet, will contain about 2,500 square feet.

EAST

New Research Lab Facilities

Stauffer Chemical Co., 420 Lexington Ave., New York 17, N. Y., announced last month that construction of a new research and development laboratory at Dobbs Ferry, N. Y., will get under way at once. When completed, the building will house the research staff of the company's eastern division now scattered at several locations in and around New York City. Located next to the Sawmill River Parkway, the building will be set in a landscaped area surrounded by lawns, shrubs and gardens. Five large laboratories for various research projects, administrative offices, technical library, work shop, and storage and service areas are provided. All rooms and laboratories will be air-conditioned and equipped with a wide variety of the most modern equipment.

Stauffer's Chauncey plant, across the Parkway, will furnish facilities for pilot-plant testing of products and processes developed at the new laboratory. The location permits the staff convenient access to New York City technical libraries and to Stauffer's general offices. Pleasant living conditions in the area will be an attraction to research employes stationed there. John F. Crowther, director of the firm's eastern research division, will be in charge.

Stauffer Chemical Co., 65 years old this year, operates thirty-odd plants in almost every industrial area of the country. Other chemical research laboratories are at Los Angeles and at Richmond (San Francisco) both in Calif., where Chester L. Arnold, director of the company's research and development department, makes his headquarters. The company also operates an agricultural chemical research laboratory at Los Altos, Calif.

J. M. Huber Corp., 342 Madison Ave., New York 17, N. Y., producer of carbon black, printing inks, and kaolin clay and independent producer of oil and gas, will spend approximately $6,000,000 this year for new plants and new oil and gas wells, H. W. Huber, president, reported to stockholders on July 31. He gave as a reason for this expansion program the fact that sales for 1950, based on operations for the first six months, will average 20% more than in 1949.

Aluminum Co. of America, Pittsburgh 19, Pa., has developed a new method for applying a seamless sheathing of aluminum to telephone and electric power cables. The new method, for which patent application has been made, involves the principle of cold reduction or swaging. Seamless aluminum sheathing for cable is thinner, stronger, and lighter in weight than the usual lead sheathing. Because of its lower density and higher yield and tensile strengths, aluminum can be applied in approximately one-half the thickness required of lead, with consequent reduction in weight of the finished sheathing. In addition, the new Alcoa product is said to be softer and more flexible than similar aluminum sheathing previously produced. The new sheathing is being tested by a number of cable manufacturers, and about 3,500 feet were used in the telephone system of Alcoa's new reduction works at Point Comfort, Tex.

Memorial Statue of Harvey S. Firestone Unveiled by His Five Sons: *(L. to R.)* Roger S., Raymond C., Russell A., Leonard K., and Harvey S., Jr.

Unveil Firestone Statue

Five sons of Harvey S. Firestone, founder of the Firestone Tire & Rubber Co., Akron, O., participated in the dedication of an impressive memorial to their father on August 3. The dedication, highlight of the company's fiftieth anniversary celebration, was presided over by Harvey S. Firestone, Jr., company chairman, and attended by his four brothers, all of whom are active in the management of the firm. Russell A. Firestone is a company director; Roger S. is president of Firestone Plastics Co.; Raymond C. is vice president of Firestone; and Leonard K. is president of Firestone Tire & Rubber Co. of California.

Located on a hilltop near the Firestone Research Bldg. in South Akron, the memorial is in the midst of 25 acres of lawns and trees. The focal point of the memorial is a statue of Harvey S. Firestone in a seated position, overlooking the array of manufacturing plants which are the core of the industrial empire he created. In the dedication ceremonies, addresses were made by the company president, Lee R. Jackson, Honorary Chairman John W. Thomas, and Rev. W. F. Tunks.

In connection with the anniversary celebration, Harvey S. Firestone, Jr., issued a statement on the "record of accomplishment" of the company during the past 50 years. This record, describing the origin and growth of the firm, gives "substantial testimony to the superiority of the American system of competitive free enterprise which has given our people the highest standard of living in the world," Mr. Firestone said.

Snell Expanding Laboratories

The research and engineering firm of Foster D. Snell, Inc., 29 W. 15th St., New York 11, N. Y., has let contracts for the first unit of its laboratories in Bainbridge, N. Y. The present building is a single wing of a structure providing for four wings with extensions.

According to Foster Dee Snell, head of the concern, the project does not envisage any change at present in the firm's activities in New York. The project, however, does provide for future expansion and in particular for the carrying on of long-term projects in a rural area where living costs for personnel are substantially lower than in large cities.

When conditions require more space, separate departments can be transferred from New York to the new location to relieve congestion at the firm's present quarters. It appears probable that the next unit to be constructed will be either a drafting room for the engineering department or a pilot plant to release the area in New York now being used for that purpose.

Cabot Opens British Plant

Godfrey L. Cabot, Inc., 77 Franklin St., Boston 10, Mass., has announced that Cabot Carbon, Ltd., its wholly owned British subsidiary, formally opened its Stanlow carbon black plant at Ellesmere Port, Cheshire, on July 28. The opening was celebrated at a luncheon in one of the warehouses of the new plant, with J. H. Wilson, M.P., presiding, and some 200 guests attending, including ECA representatives and Cabot officials.

When in full operation, the plant will produce annually approximately 20,000,000 pounds of Vulcan 3 high abrasion furnace black. The material will be produced from liquid hydrocarbons, and these raw materials will be imported initially from the United States until such time as they may be obtained from the British petroleum refining industry. A special collection system will be operated to remove carbon black from the plant exhaust, thus eliminating smoke and providing sufficient clean fuel to operate all the supplementary heating requirements of the process and the plant.

Barlow Joins Research Staff

Fred W. Barlow, formerly with Dominion Rubber Co., Ltd., Montreal, P.Q., Canada, has been placed in charge of rubber and plastics testing for Cabot's technical service and research and development departments. Following his graduation from the University of Toronto, Mr. Barlow worked in various testing laboratories in and about Ottawa, gaining general and analytical experience and much of the background which has led to his Cabot appointment.

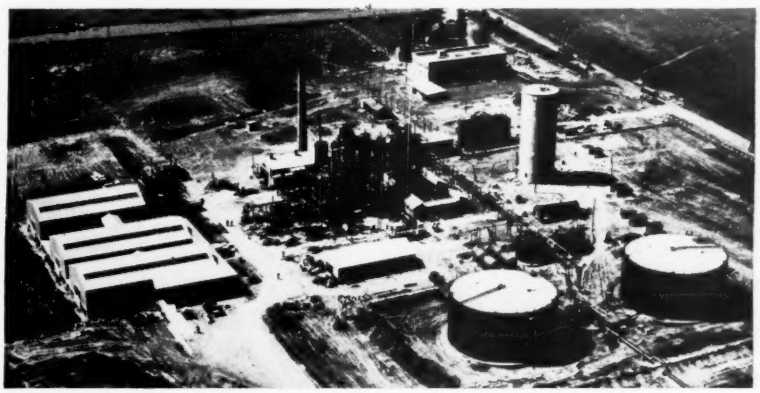
After working as a chemist in the testing laboratories of the Department of Public Works, Ottawa, Canada, where he was engaged in the physical and chemical testing of a wide variety of products submitted for the Services' requirements, he joined Dominion Rubber. He began as development engineer in the general laboratories, but was shortly promoted to group leader of the hose development section. The position included the designing of new types of hose, compounding, maintenance of quality standards, plant trouble shooting, and administrative work. Two years ago Mr. Barlow came to Pittsburgh, Pa., to the research and development laboratories of the Neville Co. and recently accepted the Cabot appointment which carries him to Boston.

Offering New Plasticizers

Pittsburgh Coke & Chemical Co., 1905 Grand Bldg., Pittsburgh 30, Pa., has announced that commercial production of a new line of plasticizers for resins, rubber, and paint is now under way at its recently completed plasticizer division plant. The new facilities at Neville Island, adjacent to the company's phthalic anhydride and tar acid refining operations, manufacture several phthalate- and phosphate-type plasticizers, a number of esters of adipic and sebacic acid, and various specialties, including polymeric-type plasticizers. The new plant is producing plasticizers that are essentially odorless, water-white, acid-free, and of constant physical and chemical properties. A new fully equipped laboratory has been set up to handle plasticizer sales service problems, as well as to permit the thorough evaluation and testing of new plasticizers developed by the company's research department.

Seiberling Joins Copolymer

J. P. Seiberling, president of Seiberling Rubber Co., Akron 9, O., announced on August 15 that his company has joined the Copolymer Corp., which operates a government synthetic rubber plant at Baton Rouge, La. Directors of Copolymer elected the Seiberling company a member "with equal participation" with the other owners. Organized in 1942, Copolymer is owned jointly by Sears, Roebuck & Co. and eight tire manufacturers: Armstrong Rubber Mfg. Co., Armstrong Rubber Co., Dayton Rubber Co., Gates Rubber Co., Lee Rubber & Tire Corp., Mansfield Tire & Rubber Co., Midland Rubber Co., and now Seiberling. H. P. Schrank, Seiberling vice president in charge of production, will represent the firm on the Copolymer board; while Ralph T. LaPorte, chief chemist, will be the technical representative.



New British Carbon Black Plant of Cabot Carbon, Ltd., at Ellesmere Port, Cheshire

Goodyear Expanding Facilities

A $5,000,000 powerhouse modernization program which will increase electrical distribution facilities and at the same time virtually eliminate discard of fly-ash from company stacks has been started by The Goodyear Tire & Rubber Co., Akron, O. Control of the fly-ash, a residue from pulverized coal used in the company's boilers, will be a big step in Akron's smoke abatement program, according to Russell DeYoung, Goodyear vice president in charge of production. Work on the program began August 1, and powerhouses at both Plants One and Two will be changed over. The program includes installation of fly-ash collectors on boilers, and the replacement of low-pressure boilers with high-pressure equipment. This installation will be supplemented by additional electrical generating and distribution equipment, new coal bunkers, coal pulverizers, and water treating equipment. The fly-ash will be collected and shipped to other concerns for use in building blocks and road surfacing materials.

Production facilities at Goodyear's Lincoln, Neb., plant will be increased by some 50% with the addition of new buildings providing more than 100,000 square feet of floor space. Cost will exceed $1,000,000. A single-story brick and steel structure will be connected to the present plant by a two-story annex at one end and a connecting bridge at the other. The additions will house offices, machine shops, warehouse and production equipment.

Announcement of the program, which will make the local plant the company's major producer of V-belts and farm machinery transmission belts, was made by R. E. Jay, plant manager. Construction will, under present plans, be completed before cold weather sets in.

At Akron, Russell DeYoung, vice president in charge of production, said that Lincoln expansion was arranged to centralize the company's production of V-belts and other small belting items and at the same time provide additional space at Akron for expanded production of heavy-duty conveyer belts.

Advances Personnel

Two advancements in Goodyear's chemical development laboratories were announced last month.

Merle E. Wendt, in charge of vinyl production development service and technical sales service on adhesives and latices, has been elevated to assistant manager of the chemical products development division, reporting to M. J. DeFrance, division manager. Wendt joined Goodyear following his graduation from Ohio State University in 1938, spending his entire time at Goodyear in chemical development and production work.

Succeeding to Wendt's former post is Kermith K. Fligor, long experienced in vinyl plastic development work. Fligor, also a graduate from Ohio State University, came to the Goodyear chemical development laboratory staff in 1949, bringing with him some 15 years of active experience in the chemical and plastics field.

M. W. Sledge has been named to replace the late E. W. Stephens as manager of the belt sales department. Formerly the assistant manager, Sledge will direct all belt sales activities and will work closely with C. F. Smith, newly appointed chief project engineer, on large conveyer belt prospects.

In a complete revamping of the department, H. R. Harrington, former senior staffman, was designated assistant manager; while J. L. Thornton becomes manager of the belt sales coal division. A. B. Walter continues as chief engineer of the coal mine division.

Sledge joined Goodyear in 1935 as a member of the production squadron following graduation from Auburn University. A member of the mechanical goods division since 1936, he interrupted his Goodyear career by accepting a commission in the U. S. Army early in World War II.

Harrington came to Goodyear in 1922, following graduation from Cornell. A former specifications representative in the export division, he will head up the merchandising program.

A former senior sales engineer, Thornton has been a Goodyear employe since 1942. He will coordinate all coal field sales activity.

Prior to his present appointment, Smith was a senior sales engineer. He started with the company in 1917 as a pipe fitter and attended Goodyear Industrial University.

Jack L. Kelly, assistant district manager, Atlanta, has been made district manager at Phoenix, Ariz., to succeed Carroll L. James, who has been transferred to Goodyear Export Co. as sales manager, South Africa.

With the company since May, 1926, Mr. Kelly was first a member of the sales squadron in Akron, served as a general line salesman in Birmingham in 1929 and New Orleans in 1930, as truck and bus tire salesman in Birmingham in 1931, as store manager at Atlanta in 1934, and as assistant district manager there in 1937.

Mr. James has been with Goodyear since 1933 and has served in retail stores, Los Angeles, as store manager, Santa Monica, and general line at San Francisco and Los Angeles. After two years in the Army he returned as truck tire salesman in Los Angeles and in April, 1947, was made assistant district manager at Los Angeles. He was named manager of the El Paso (later Phoenix) district in 1947.

E. J. Dunlavy, of the Vinylfilm sales department, has been transferred from Akron to the New York offices of the company, where he will report to William J. O'Keefe, New York district manager for the division. Dunlavy joined Goodyear following service with the Navy.

Scrap Rubber Freight Rates Down

The Scrap Rubber Institute of the National Association of Waste Material Dealers, Inc., has announced that the Class 19 rating of scrap rubber between points in official territory went into effect August 15. This reduced freight rate, averaging about 15%, does not include the extended Zone "C" in Wisconsin and the Western Trunk Line Northwest Territory. Concurrences from these areas is expected to be obtained in the near future, according to L. N. Larsen, of H. Muehlstein & Co., Inc., and chairman of the Institute's traffic committee.

At a recent meeting of the committee, which also includes Roger Ottignon, Nat E. Berzen, Inc., C. S. Geiger, A. Schulman, Inc., and E. W. Kneessy, Muehlstein, the following suggestions were put forth to enable dealers to receive the fullest advantages of the reduced rates: (1) suitable railroad equipment is needed if the dealer is to stow the necessary minimum carload weights of scrap rubber; (2) shippers must load only clean cars to avoid freight penalties; and (3) the marked tare weights on boxcars should be checked against actual weight to insure accuracy and avoid shortages when weighed by scrap rubber consumers.

Goodrich Wins Safety Award

The B. F. Goodrich Co. received the National Safety Council's Distinguished Service to Safety Award for its outstanding 1949 safety record. The award, consisting of a plaque and flag, was presented to Goodrich President John L. Collyer by Ned H. Dearborn, Council president, at a luncheon on July 24 at the Mayflower Hotel, Akron. In making the presentation, Mr. Dearborn pointed out that the frequency rate of accidents to Goodrich employes in all plants during 1949 was only 62% that of the average for the rubber industry as a whole; while the accident severity rate was only 37% that of the entire industry. The Award entitles all Goodrich plants, including those of B. F. Goodrich Chemical Co., Hood Rubber Co., and B. F. Goodrich Co. of Canada, to fly the Distinguished Service to Safety Award flag.

Adding to Los Angeles Plant

Construction of a new $300,000 addition to present warehouse facilities at Goodrich's Los Angeles, Calif., tire and tube manufacturing plant began last month. The building, expected to be ready the middle of December, will give the plant a total of 645,000 square feet of floor space—with 200,000 square feet devoted to finished goods warehouse.

It will be served by a double siding of the Union Pacific Railroad and provide shipping docks for 12 railroad cars and 14 trucks at one time.

According to L. R. Keltner, manager of the Los Angeles plant, the new warehouse space will be a one-story structure designed to "most effectively utilize available ground area and offer excellent opportunity for later expansion if necessary."

L. T. Greiner, Pacific Coast manager of the company's replacement tire division, reports that the new warehouse space will speed up the filling of customers orders and is "being constructed now to better serve the expanded tire market which has developed on the West Coast."

Such warehouse facilities at the company's Los Angeles plant serve as the distribution point for tires and tubes over the 11 western states. A master warehouse, opened at Portland, Oreg., earlier this year, serves as an auxiliary unit for quick service to dealers throughout the Pacific Northwest, Greiner reports.

"Cold Rubber" for Belts

Use of "cold rubber" in some of the conveyer and elevator belts which it manufactures was announced by Goodrich. When properly compounded for use in such belts, "cold rubber" should add from 10-25% more wear in certain service, the company declares.

Tacony Rubber Products Corp. recently moved from 6432 Edmund St., Philadelphia, Pa., to Sixth Ave. and Colwell Lane, Conshohocken, Pa. The firm, which manufactures druggists' sundries and toys, was established in 1922. Collins E. McGovern is president.

Rubber BLACKS

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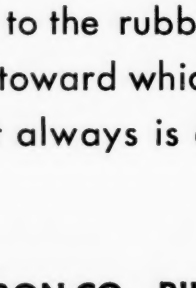


U. S. Rubber Promotes Wendes, Monahan, and Other Men

John C. H. Wendes has been appointed production manager of the Naugatuck Chemical division, United States Rubber Co., Rockefeller Center, New York 20, N. Y. Mr. Wendes will supervise all manufacturing and engineering operations in the synthetic rubber plants operated by the division in Naugatuck, Conn., and Port Neches, and Borger, both in Tex. He will also supervise manufacturing and engineering activities in the Marvinol vinyl resin plant at Painesville, O., and the Naugatuck Chemical plant at Naugatuck. A veteran of 22 years' experience with the company, Mr. Wendes played a prominent part in the organization and construction of the U. S. synthetic rubber industry.

At the same time Joseph P. Monahan was made general control manager of Naugatuck Chemical. Mr. Monahan will be in executive charge of accounting and accounting control in all four plants of the division.

Both men will make their headquarters in Naugatuck, Conn.

Richard K. Opper has been made assistant sales manager of rubber chemicals for Naugatuck Chemical, with headquarters at Naugatuck, Conn. He was formerly the technical sales representative for rubber chemicals in the Chicago area. He joined U. S. Rubber in 1929 as a chemist in the general laboratories at Passaic, N. J. In 1946, however, he entered sales work for Naugatuck Chemical.

Howard G. Ling, formerly technical representative in New York, replaces Mr. Opper in the Chicago district. Mr. Ling has been active in rubber technology since 1928 and until recently was vice chairman of the New York Rubber Group.

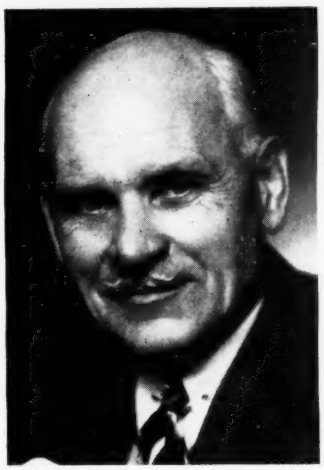
David E. Welch has been named technical representative in the New York area, succeeding Mr. Ling. He will make his headquarters in Lumberville, Pa. Mr. Welch was with the B. F. Goodrich Co. and the Office of Rubber Reserve in Washington, D.C., prior to joining Naugatuck Chemical.

Thomas H. Fitzgerald has been appointed sales manager of reclaimed rubber for Naugatuck Chemical. Mr. Fitzgerald started with U. S. Rubber 27 years ago at its Bristol, R. I., plant as a chemist in 1923. He jointed Naugatuck Chemical in 1943 in the development department, specializing in rubber chemicals and reclaimed rubber. Until his new promotion he was a technical sales representative for reclaimed rubber.

John M. Miller has been named an assistant general manager of the tire division. Formerly factory manager at Los Angeles, Mr. Miller will now headquarter at the company's central office in New York. He joined U. S. Rubber in 1940 in the mechanical division in charge of the Providence, R. I., factory and has a background of 30 years in the rubber field. Miller served in the Armed Forces in World War I and during World War II managed the Scioto Ordnance plant at Marion, O., for U. S. Rubber. He subsequently spent seven years on the West Coast as factory manager.

Richard B. Behrman, industrial relations manager at the Los Angeles plant, has been named factory manager there to succeed Miller.

Lawler B. Reeves, former assistant director of manufacturer's sales, was given the new assignment of manager of government sales, with offices at the Detroit plant. Reeves became employed by the company in sales in his native Oklahoma City in 1941.



Pach Bros.

John C. H. Wendes

Thomas J. Newton, manager of the tire engineering replacement section, was appointed to the position of general service manager of the Tire Division. He served in the War Department as assistant rubber director in 1944 and 1945 and has been employed by U. S. Rubber in test wheel and field service engineering for 15 years. He replaces K. F. Morlen, who moves to New York to become manager of cycle tire sales.

Gregg T. Ward, general merchandise sales manager of the rubber company's footwear and general products division, last month announced the following promotions in the branch sales organization.

Eugene W. O'Reilly, district manager of the Minneapolis branch, has been named district manager of footwear, clothing, and Koylon foam sales at New York branch, succeeding Fred M. Bock, Jr., now manager of the branch sales personnel department of company headquarters in Rockefeller Center.

Replacing Mr. O'Reilly at Minneapolis is Thomas L. Mesenbourg, a salesman in that branch.

George L. Buete, district manager of the Philadelphia branch since February, 1945, has been made district manager of footwear, clothing, and Koylon foam sales at Baltimore branch. The new district manager at Philadelphia is Howard Livesey, promoted from assistant district manager there.

Chester L. Baker, assistant district manager of San Francisco branch, has been appointed district manager of footwear, clothing, Koylon foam, and general products sales at the Kansas City branch.

Other U. S. Rubber Announcements

U. S. Rubber's proving grounds at Lancaster, Calif., observed the occasion of 1,400,000 miles of accident-free driving by its test fleet with a Safety Celebration on July 29. To acknowledge the event a Safety Award was presented to Richard Beresford, manager of the Lancaster installation, by Ernest W. Beck, company safety director. In the experimental station the company operates a fleet of cars and trucks to test its tires and tubes under all conditions of driving.

A small rubber cup developed by U. S. Rubber is utilized in a newly designed cherry pitting machine made by the Dunkley Co., Kalamazoo, Mich. The machine employs 700 of these rubber cups and permits the pitting of cherries with a cleaner, smaller hole and a minimum loss from crushing and tearing. This reduction in waste is expected to make it economically feasible to pack sweet dessert cherries without pits, in addition to maraschino cherries.

Win Government Contracts

Department of Defense, Washington 25, D. C., recently announced the awarding of the following contracts for: tires and tubes, Denman Rubber Mfg. Co., Warren, O., $532,180, Lee Tire & Rubber Co., Conshohocken, Pa., $545,048.60, Inland Rubber Corp., Chicago, Ill., $1,304,831, Goodyear Tire & Rubber Co., Akron, O., $379,308.90, Mohawk Rubber Co., Akron, $799,680, Cooper Tire & Rubber Co., Findlay, O., $3,638,736.50, Robbins Tire & Rubber Co., Tuscombia, Ala., $169,336, Carlisle Corp., Carlisle, Pa., $460,765, Mansfield Tire & Rubber Co., Mansfield, O., $1,455,518, Dayton Rubber Co., Dayton, O., $1,659,950, Pennsylvania Rubber Co., Mansfield, $323,175, Truck Tire Sales Co., Akron, $289,260; automotive parts and supplies, B. F. Goodrich Co., Akron, $434,-116.80; wheels and brakes, Goodrich, $199,-651.21, Goodyear, $126,897.45; auto spare parts, Firestone Industrial Products Co., Akron, $1,993,045, Tru-Flex Rubber Products Co., Los Angeles, Calif., $113,595, Mohawk, $196,635, Cooper, $265,400.60, Goodyear, $1,377,530.40.

Also for: gas masks and related items, Firestone Products, Fall River, Mass., $2,313,776.16; cable, General Cable Corp., Perth Amboy, N. J., $2,457,411.90, John A. Roebling Sons Co., Trenton, N. J., $120,719.37; mukluk-type flying shoes, Bristol Mfg. Co., $106,425; pneumatic mattresses, New York Rubber Corp., New York, N. Y., $589,920; cotton duck, Mt. Vernon-Woodberry Mills, Baltimore, Md., $1,857,425; services and materials to convert airship cars, Goodyear Aircraft Corp., Akron, $434,383; synthetic rubber-coated cotton cloth sheeting, Plymouth Rubber Co., Inc., Canton, Mass., $399,600; rifle and special parts therefor, Firestone Tire & Rubber Co., Akron, $374,432.74; adhesive tape, Mystik Adhesive Products Division, Chicago Show Printing Co., Chicago, $357,000.

Carbide & Carbon Chemicals Division, Union Carbide & Carbon Corp., 30 E. 42nd St., New York 17, N. Y., has announced the completion and initial operation of facilities for the production of ethylene oxide at its plant in Whiting, Ind. These units are part of the company's planned large-scale increase in the production of ethylene glycol, and additional facilities at Whiting now under construction are expected to begin operation late in the year. New production units for ethylene glycol went into operation earlier this year at Carbide's Institute, W. Va., plant, and further expansion of this capacity is also under construction for completion late this year. Present annual production of ethylene glycol in the United States is 210,000 tons, and with the construction of new facilities by Carbide and other producers, this figure is expected to exceed 320,000 tons by early 1951.

Hale, Kullgren Form Company

The formation of a new company, Hale & Kullgren, Inc., with offices at 326 S. Main St., Akron 8, O., has been announced by Andrew Hale and G. V. Kullgren. The new firm is associated with Aetna-Standard Engineering Co., Youngstown, O., and will act as its sole representatives in the design, development, and distribution of processing equipment for the rubber and the plastics industries. According to Ernest E. Swartswelter, president of Aetna-Standard, his company will provide facilities to furnish equipment designed and developed by Hale & Kullgren to meet individual requirements in the industry.

Mr. Hale joined Farrel-Birmingham Co., Inc., in 1923 as manager of its Akron office and left in 1945 to become vice president in charge of sales and engineering for Adamson United Co., a position from which he recently resigned. During the war years he was connected with the Office of Rubber Director as a counsel on mill room equipment.

Mr. Kullgren was with General Electric Co. from 1933 to 1943 as an application engineer, joined Farrel-Birmingham in 1943 as assistant manager of the Akron office, and was in charge of all contract engineering for Adamson United from 1945 until recently.

Ames Rubber Corp., Hamburg, N. J., recently elected J. H. White, Jr., president; Laurence Edland, executive vice president; and E. T. McKay, vice president and sales manager.

WEST

The 1950 Paint Industries' Show will be held at the Congress Hotel, Chicago, Ill., November 9-11 in conjunction with the twenty-eighth annual meeting of the Federation of Paint & Varnish Production Clubs. Included among the exhibitors scheduled for the Show are: Advance Solvents & Chemical Corp., American Cyanamid Co., Bakelite Division, Union Carbide & Carbon Corp., Baker Castor Oil Co., and Binney & Smith Co., all of New York, N. Y.; J. H. Day Co., Cincinnati, O.; General Electric Co., Pittsfield, Mass.; Goodyear Tire & Rubber Co., Akron, O.; The Neville Co., Pittsburgh, Pa.; Rohm & Haas Co., Philadelphia, Pa.; South Florida Testing Service, Miami, Fla.; U. S. Stoneware Co., Akron; and Witco Chemical Co., Chicago.

Meyercord Co., Chicago, Ill., has developed a new type of Elasti-cal decalcomania for full color decoration of brand marking on canvas footwear, sporting goods, and outdoor clothing. An adaptation of the type V Elasti-cal commonly used for colorful identification and design on vinyl surfaces, the new transfer may be applied quickly and easily to canvas or duck by either hand or steam press at production-line speeds. The new decal forms an edgeless part of the canvas surface and stretches and breathes with the fabric. The decal is washable, sunfast, and may be expected to last the life of the product, it is further claimed.

Changes at Phillips Petroleum

K. S. Adams, president of Phillips Petroleum Co., Bartlesville, Okla., has announced that the directorate at its recent meeting in New York, N. Y., took action on several official personnel changes that became effective August 1, after G. G. Oberfell had retired from active duty under the provisions of the company's retirement plan.

Oberfell, a member of the board and of the executive committee, as well as vice president of research and development, started with the company nearly 26 years ago. He established the research department and is a recognized authority on petroleum research, especially in the fields of natural gasoline, natural gas, and lighter hydrocarbons.

B. F. Stradley, secretary and treasurer for several years, was elected to the board and to the executive committee and was named vice president and treasurer. He served in the credit division and in other assignments within the treasury department for 26 years.

R. W. Thomas, manager of the research and development department, was elected vice president of research and development and will supervise research and patent activities, as well as chemical manufacturing, development, and sales. He started in the engineering department in 1926 and for several years thereafter pioneered the development of markets for liquefied petroleum gases, with offices at Detroit, Mich. He took over his present duties at the headquarters office about ten years ago.

Paul J. Parker, assistant secretary and assistant treasurer, was elected secretary and assistant treasurer. He entered company employment in 1936 as a staff attorney in the legal department and moved into the treasury department in 1945.

Wright Mfg. Co., Houston, Tex., has reported that heaviest sales in the company's history were noted for its 3/16-inch rubber tile during the first part of the summer. Not only did the firm receive a greater volume of orders for the thicker tile, but the orders were for large quantities of the material.

B. R. Scheff, general sales manager of the Wright company, recently warned company distributers of the disadvantages not only to consumers, but also to the trade of scare buying and hoarding. He advised the distributers "to keep on hand a reasonable supply of rubber tile at all times, to check inventories carefully and to be sure of being able to meet any reasonable demand."

OBITUARY

George L. Lawrence, Jr.

THE vice president in charge of sales of the industrial products division of Tyer Rubber Co., Andover, Mass., George L. Lawrence, Jr., died August 8 in Maine. Born in Dorchester, Mass., July 1, 1887, the deceased had been in poor health for the past year.

Mr. Lawrence was graduated from M.I.T. in 1909 with an S.B. degree in civil engineering.

From 1909 to 1910 he did engineering work in Massachusetts and New York and in 1911 joined the McElwain Shoe Co., where he remained until 1914. The next year he became associated with the old Boston Rubber Shoe Co., where he served successively as assistant superintendent, superintendent, factory manager, and production manager before leaving in 1922 to go with Tyer Rubber. At Tyer, Mr. Lawrence was factory manager and secretary before becoming vice president in 1935; he was also on the directorate.

The deceased was a Mason in the Wyoming Lodge.

Funeral services were held August 10 from the Lawrence home, followed by burial in Melrose, Mass.

Surviving are the widow, a son, a daughter, and several grandchildren.

United States Rubber Industry Employment, Wages, Hours

	Prod. Workers 1000's	Ave. Week. Earnings	Ave. Week. Hours	Ave. Hour. Earnings	Consumers Price Index
All Rubber Products					
1939	121	$27.84	39.9	$0.745	99.4
1948	209	56.78	39.0	1.456	171.2
1949	186	57.79	38.3	1.509	169.1
May	185	57.08	37.7	1.514	169.2
June	181	58.29	38.2	1.526	169.6
July	177	58.37	38.4	1.520	168.5
Aug.	180	57.72	38.3	1.507	168.8
Sept.	167	61.01	40.3	1.514	169.6
Oct.	187	59.57	39.4	1.512	168.5
Nov.	186	57.91	38.4	1.508	168.6
Dec.	187	59.04	39.2	1.506	167.5
1950					
Jan.	187	60.52	39.4	1.536	166.9
Feb.	188	59.90	39.2	1.528	166.5
Mar.	189	59.66	39.3	1.518	167.0
Apr.	190	61.76	40.0	1.544	167.3
Tires and Tubes					
1939	54.2	$33.36	35.0	$0.957	
1948	96.2	62.16	37.2	1.671	
1949	83.6	63.26	36.4	1.738	
May	87.2	63.20	36.3	1.741	
June	86.3	64.09	36.6	1.751	
July	82.0	64.45	36.6	1.761	
Aug.	80.9	62.32	36.0	1.731	
Sept.	64.3	69.95	39.1	1.789	
Oct.	81.1	64.83	37.3	1.738	
Nov.	81.3	63.91	36.9	1.732	
Dec.	82.1	64.79	37.3	1.737	
1950					
Jan.	82.6	67.70	38.4	1.763	
Feb.	83.1	67.22	38.3	1.755	
Mar.	83.4	65.26	37.4	1.745	
Apr.	84.0	69.23	39.0	1.775	
Rubber Footwear					
1939	14.8	$22.80	37.5	$0.607	
1948	24.6	51.75	41.8	1.238	
1949	21.6	48.94	38.6	1.268	
May	20.5	48.39	38.5	1.257	
June	19.8	50.35	39.4	1.278	
July	20.2	48.84	38.7	1.262	
Aug.	20.3	48.78	38.9	1.254	
Sept.	21.1	51.71	40.4	1.280	
Oct.	21.5	49.81	39.1	1.274	
Nov.	22.2	50.51	39.9	1.266	
Dec.	22.1	50.23	39.8	1.262	
1950					
Jan.	20.1	45.87	35.7	1.285	
Feb.	18.8	43.06	34.2	1.259	
Mar.	19.4	51.04	40.0	1.276	
Apr.	19.3	50.36	39.5	1.275	
Other Rubber Products					
1939	51.9	$23.34	38.9	$0.605	
1948	88.1	52.47	40.3	1.302	
1949	80.9	54.38	40.1	1.356	
May	77.2	52.51	39.1	1.343	
June	75.3	53.85	39.8	1.353	
July	74.5	54.11	40.2	1.346	
Aug.	78.6	55.46	40.6	1.366	
Sept.	81.4	56.50	41.3	1.368	
Oct.	84.4	57.06	41.5	1.375	
Nov.	82.8	54.04	39.5	1.368	
Dec.	83.1	55.66	40.9	1.361	
1950					
Jan.	84.5	57.04	41.3	1.381	
Feb.	86.3	56.43	41.1	1.373	
Mar.	86.2	56.21	41.0	1.371	
Apr.	86.9	57.13	41.1	1.390	

SOURCE: BLS, United States Department of Labor, Washington, D. C.

NEWS ABOUT PEOPLE

R. G. Tabors

R. G. Tabors has been appointed manager, hydraulic press and power tool department, The Baldwin Locomotive Works, Eddystone, Pa. His time will be devoted exclusively to furthering the sales of these products which, for decades, have enjoyed a good reputation in the metal working, plastics, and rubber fields. Mr. Tabors joined the Baldwin organization in February, 1937, and served as sales engineer until 1943 when he entered the Army. He returned to Baldwin in January, 1948, as sales manager, press and power tool department.

Bradley Dewey, Jr., has been appointed manager of the Cryovac division of Dewey & Almy Chemical Co., Cambridge, Mass. Dr. Dewey, who succeeds John A. Lunn, resigned, will head up the sales, manufacturing, and research activities of the division, which manufactures Cry-O-Rap bags and tubing from a special Dewey and Almy-Dow Saran plastic for use in packing frozen and refrigerated meats, poultry, fish, and other foods. After being packed, the airtight Cry-O-Rap bags are vacuumized, then sealed and shrunk to fit like a second skin, preventing loss of weight through dehydration and freezer burns in frozen foods and premature spoilage of refrigerated foods.

Fred J. Bowman, for the past 16 years vice president, Wilson Sporting Goods Co., Chicago, Ill., last month was elected president of the company to succeed **L. B. Icely,** who died August 8 after having been president of the concern 32 years.

Vernon R. Childress has joined the marketing division of the chemical department of General Electric Co. at Pittsfield, Mass. After post-graduate work at his Alma Mater, Alabama Polytechnic Institute, Mr. Childress in 1940 joined The B. F. Goodrich Co., where he worked in many fields from research to materials control. In 1945 he was appointed to sales service and, later, to sales where he remained until 1947. In October of that year he went to the O'Sullivan Rubber Co., Winchester, Va., as manager of plastics sales.

Robert K. Multer has joined the laboratory staff of Marbon Corp., Gary, Ind., as a development engineer. Mr. Multer was graduated from Cornell University in June, 1950, with a B.S. degree in chemical engineering.

W. J. R. Hauser, for more than 16 years a vice president of Heveatex Corp., Melrose, Mass., has left the company. He continues to make his office at 155 E. 47th. St., New York 17, N. Y., but has not as yet disclosed his future plans.

F. B. Havens, formerly technical field service representative, pigment department, American Cyanamid Co., Calco Chemical Division, Bound Brook, N. J., has been appointed Pacific Coast regional manager, with headquarters in San Francisco, Calif. Mr. Havens has been associated with the protective coatings and dry color industries for the past 20 years. Prior to joining Calco in 1945, he was vice president and chief chemist of the Prince Mfg. Co.

F. B. Havens

William M. Shine has joined the plastics department of Arnold, Hoffman & Co., Inc., and will be located in its New York office in the Empire State Bldg. Mr. Shine was formerly with the central sales development department of General Aniline & Film Corp. and prior to that with the plastics department of General Electric.

Mildred H. Plumb has joined Firestone's public relations department, in charge of publicity for the plastics division. Miss Plumb, formerly account executive for Firestone plastics at the Fred Eldean Organization, will be located at the Firestone offices in the Empire State Bldg., New York, N. Y.

Robert N. Black has been appointed supply manager of Borg-Warner International Corp., Chicago, Ill. Mr. Black, who recently returned from a six-month business tour of South America, joined Borg-Warner International in April, 1947. Previously he had been an accountant with General Motors Corp. in Buffalo.

M. R. Bell has been appointed factory manager of the new plant of Arrowhead Rubber Co. now in operation at Downey, Calif. Mr. Bell formerly was factory manager of the rubber division of The Thermoid Corp., Trenton, N. J. Since earning his M.E. degree from Case Institute of Technology, Mr. Bell has accumulated 17 years of experience in industry, serving four years as foreman of the new products division of National Carbon Co., five years with The B. F. Goodrich Co., and three years with the Pharis Tire & Rubber Co., where he was manager of the aero division and general manager of the Parkersburg Products Co., a subsidiary. From the close of World War II until he joined Thermoid, Mr. Bell was engaged in the molding of special experimental molded goods at his own plant in Parkersburg, W. Va.

Harold D. McAneny has been appointed director of advertising of The Flintkote Co., 30 Rockefeller Plaza, New York 20, N. Y. Prior to joining Flintkote, Mr. McAneny was advertising manager of The Richmond Radiator Co.; he was also formerly connected with The Morris F. Swaney and Henry A. Loudon advertising agencies as an account executive. Before the war, during which he served in the Army, he was with The Kudner Advertising Agency.

E. F. "Tom" Riesing, widely known throughout the automotive and associated industries, has joined the National Motor Bearing Co., Redwood City, Calif., as sales manager of the industrial division. Mr. Riesing was previously affiliated with the Firestone Tire & Rubber Co. for the past 17 years and had served for some time as manager of automotive engineering and sales of the industrial products division. A graduate of the University of Wisconsin, Mr. Riesing spent two years early in his career in engineering work in Europe, including a year supervising the erection of conveyer installations in major Soviet industrial plants in Russia for the Chain Belt Co. of Milwaukee. He is a past chairman of the Rubber & Plastics Division, ASME, and a member of many other technical and scientific organizations. His office for the National Motor Bearing Co. will be in the Fisher Bldg., Detroit, Mich.

E. F. Riesing

FINANCIAL

American Cyanamid Co., New York, N. Y., and wholly owned subsidiaries. First six months, 1950: consolidated net earnings, $16,598,401, equal to $4.55 each on 3,552,022 common shares, compared with $6,407,248, or $2.09 each on 2,737,686 shares, in the corresponding period of 1949; net sales, $144,247,431, against $113,659,005.

Anaconda Wire & Cable Co., New York, N. Y. Six months to June 30: net income, $1,927,049, equal to $2.28 a share, against $1,722,383, or $2.04 a share, a year earlier.

Baldwin Locomotive Works, Philadelphia, Pa., and wholly owned subsidiaries. First six months, 1950: net profit, $1,552,645, equal to 62¢ each on 2,375,298 common shares, contrasted with $1,829,627, or 74¢ each on 2,375,553 shares, a year earlier; sales, $45,930,859, against $68,032,019.

Belden Mfg. Co., Chicago, Ill. Half ended June 30: net profit, $711,070, equal to $2.22 a common share, against $191,707, or 60¢ a share, in the '49 half.

Borg-Warner Corp., Chicago, Ill. June half, 1950: net income, $15,779,073, equal to $6.62 a common share, against $10,889,051, or $4.52 a share, a year earlier; net sales, $152,740,274, against $146,028,940.

Brown Rubber Co., Inc., Lafayette, Ind. First half, 1950: net profit, $594,085, equal to $1.58 a common share, against $700,657, or $2.79 a share, in the first half of 1949.

Canada Wire & Cable Co., Ltd., Leaside, Ont. First half, 1950: net income, $1,003,000, equal to $6.26 a class B share, against $577,000, or $3.44 a share, in last year's period.

Philip Carey Mfg. Co., Cincinnati, O., and subsidiaries. First half, 1950: net income, $1,399,509, equal to $1.69 a common share, against $1,042,510, or $1.25 a share, in the like period last year; sales, $20,976,915, against $18,117,261.

Columbian Carbon Co., New York, N. Y., and subsidiaries. First six months, 1950: net profit, $2,930,524, equal to $1.82 each on 1,612,218 capital shares, compared with $3,618,092, or $2.24 a share, in last year's half; sales, $22,721,520, against $19,238,186.

Cooper Tire & Rubber Co., Findlay, O. Initial half, 1950: net profit, $122,472, equal to 78¢ a common share, against net loss of $93,053 in the corresponding period of 1949; net sales, $5,139,909, against $2,891,172.

Crown Cork & Seal Co., Inc., Baltimore, Md. First half, 1950: net income, $732,109, equal to 38¢ a common share, compared with $1,067,708, or 66¢ a share, in last year's half; net sales, $38,195,422, against $40,519,731.

DeVilbiss Co., Toledo, O., and subsidiary. First half, 1950: net income, $267,111, equal to 89¢ a share, against $211,743, or 70¢ a share, in the '49 half.

Dow Chemical Co., Midland, Mich. Year ended May 31, 1950: consolidated net income, $33,813,105, equal to $5.73 a common share, against $25,260,473, or $4.04 a share, in the preceding fiscal year; sales, $220,830,183, against $200,370,952.

Flintkote Co., New York, N. Y., and subsidiaries. January 1-July 15, 1950: net earnings, $3,123,007, equal to $2.33 a common share, compared with $2,346,354, or $1.71, a share, in the corresponding period last year; net sales, $37,848,877, against $33,505,953.

General Cable Corp., New York, N. Y. First half, 1950: net profit, $727,000, equal to 18¢ each on 1,917,646 common shares, against $1,159,905, or 41¢ a share, in the first half of 1949.

General Motors Corp., Detroit, Mich. Six months ended June 30: consolidated net income, $485,277,389, equal to $10.90 a common share, contrasted with $303,678,643, or $6.76 a share, in the like period last year; sales, $3,606,300,692, against $2,877,674,126.

B. F. Goodrich Co., Akron, O., and subsidiaries. Half ended June 30: net earnings, $12,427,793, equal to $8.76 each on 1,320,301 common shares, contrasted with $8,909,635, or $6.02 each on 1,308,320 shares, in the first half of 1949: net sales, $231,612,854, against $192,149,550.

Byron Jackson Co., Los Angeles, Calif. Six months to June 30: net profit, $548,433, equal to $1.45 a share, against $895,683, or $2.36 a share, in last year's half.

O'Sullivan Rubber Corp., Winchester, Va. First half, 1950: net income, $59,479, equal to 11¢ a common share, contrasted with deficit of $31,777 in last year's half; net sales, $2,400,531, against $1,692,254.

Goodyear Tire & Rubber Co., Akron, O., and subsidiaries. First six months, 1950: consolidated net income, $11,914,465, equal to $5.08 each on 2,065,411 common shares, contrasted with $8,133,358, or $3.24 a share, in the first six months of 1949; net sales, $344,887,654, against $311,823,235.

Koppers Co., Inc., Pittsburgh, Pa. First six months, 1950: net income, $5,168,506, equal to $3.01 each on 1,617,125 common shares, compared with $3,919,928, or $2.24 a share, in last year's months; net sales, $96,972,823, against $101,456,187.

Phillips Petroleum Co., Bartlesville, Okla., and subsidiaries. First six months, 1950: net profit, $22,039,857, equal to $3.64 each on 6,051,121 shares, compared with $21,953,129, or $3.63 each on 6,047,139 shares, in last year's half. Recent dividend action raised the annual rate on a share to $4 from the $3 a share paid annually since August 30, 1947.

Rome Cable Corp., Rome, N. Y. June quarter: net profit, $260,256, equal to 60¢ a common share, against $13,530 a year earlier.

Socony-Vacuum Oil Co., Inc., New York, N. Y. First half, 1950: consolidated net income, $45,000,000, equal to $1.41 a share, against $47,000,000, or $1.45 a share, in the corresponding half of 1949.

Sun Oil Co., Philadelphia, Pa., and subsidiaries. June half: net income, $13,150,663, equal to $2.38 each on 5,427,483 common shares, contrasted with $12,822,993, or $2.56 each on 4,934,207 shares, in the first half of 1949.

Timken Roller Bearing Co., Canton, O. First six months, 1950: net profit, $8,201,944, equal to $3.39 each on 2,421,380 capital shares, contrasted with $4,163,387, or $1.72 a share, in the corresponding period of 1949.

(*Continued on page 730*)

Dividends Declared

Company	Stock	Rate	Payable	Stock of Record
Armstrong Rubber Co.	A & B	$0.25 q.	Sept. 28	Sept. 15
	4¾ Cum. Cv. Pfd.	0.59⅜ q.	Oct. 2	Sept. 15
Belden Mfg. Co.	Com.	0.40 incr.	Sept. 1	Aug. 17
Boston Woven Hose & Rubber Co.	Com.	0.50 q.	Aug. 25	Aug. 15
Brunswick-Balke-Collender Co.	Com.	0.50 incr.	Sept. 15	Sept. 1
	$5 Pfd.	1.25 q.	Oct. 2	Sept. 20
Canada Wire & Cable Co., Ltd.	A	1.00 q.	Sept. 15	Aug. 31
	B	0.75	Sept. 15	Aug. 31
Crown Cork International	A	0.25 q.	Oct. 2	Sept. 12
Dewey & Almy Chemical Co.	Com.	0.40	Sept. 20	Sept. 12
Firestone Tire & Rubber Co.	4½% Pfd.	1.12½ q.	Sept. 1	Aug. 15
Flintkote Co.	Com.	0.50 q.	Sept. 11	Aug. 26
	Pfd.	1.00 q.	Sept. 15	Sept. 1
General Motors Corp.	Com.	2.50 extra	Sept. 9	Aug. 14
	Com.	1.50	Sept. 9	Aug. 14
	$5 Pfd.	1.25 q.	Nov. 1	Oct. 9
	$3.75 Pfd.	0.93¾ q.	Nov. 1	Oct. 9
General Tire & Rubber Co.	Com.	0.25 q.	Aug. 31	Aug. 21
Goodyear Tire & Rubber Co.	Com.	1.00 q.	Sept. 15	Aug. 15
	$5 Pfd.	1.25 q.	Sept. 15	Aug. 15
Johnson & Johnson	Com.	0.50 q.	Sept. 11	Aug. 25
I. B. Kleinert Rubber Co.	Com.	0.25 q.	Sept. 12	Aug. 28
Lea Fabrics, Inc.	Com.	0.37½	Aug. 31	Aug. 10
Minnesota Mining & Mfg. Co.	Com.	0.80	Sept. 12	Aug. 22
	Pfd.	1.00 q.	Sept. 12	Aug. 22
National Automotive Fibres, Inc.	Com.	0.40 q.	Sept. 1	Aug. 10
United Elastic Corp.	Com.	0.75 q.	Sept. 8	Aug. 18
United States Rubber Co.	Com.	0.25 extra	Sept. 9	Aug. 21
	Com.	0.75 q.	Sept. 9	Aug. 21
	8% 1st Pfd.	2.00 q.	Sept. 9	Aug. 21
Westinghouse Air Brake Co.	Com.	0.50 q.	Sept. 15	Aug. 1

Patents and Trade Marks

APPLICATION

United States

2,495,761. **In a Method of Splicing Layers of Sheet Material, a Layer of Open-Mesh Bonding Material Formed of Heat-Sensitizable Adhesive Polyvinylidene Chloride Filaments.** J. C. Platt, Gainesville, Ga., assignor to Chicopee Mfg. Corp. of Georgia, a corporation of Ga.

2,496,219. **In Combination with a Pump Having a Pump Housing and a Shaft-Supporting Sleeve Telescoped in the Mouth of the Housing, a Rubber-Like Ring between Sleeve and Housing to Seal the Mouth and to Support the Sleeve.** F. F. Kishline, assignor to Nash-Kelvinator Corp., both of Kenosha, Wis.

2,496,258. **In a Container Having a Dispensing Spout, a Soft Resilient Plastic Self-Sealing Element in the Discharge Opening of the Container and Puncturable by the Spout.** P. Alexander, New York, N. Y., assignor to Prel, Inc., a corporation of N. J.

2,496,387. **Denture Liner of Methyl Methacrylate Polymer and Polyethylene Glycol.** A. Fink, New York, N. Y.

2,496,460. **Pneumatic Float.** J. Evans, Shelton, assignor to Armstrong Rubber Co., West Haven, both in Conn.

2,496,470. **Rubber-Like Ball Valve to Seal a Drain Opening of a Vacuum Tank.** F. G. Hodsdon, Milwaukee, Wis., assignor to International Harvester Co., a corporation of N. J.

2,496,479. **Inflatable Life Belt in a Life Belt Projectile.** W. B. Kochner, St. Louis, Mo., and L. T. Ward, East Orange, N. J., assignors, by mesne assignments, to Knapp-Monarch Co., St. Louis.

2,496,667. **For Fluid-Carrying Pipes or Conduits, a Coupling Including a Cylindrical Ferrule Having a Rubberized Fabric Liner and at Each End a Rubber Ring Cemented to the Liner.** J. M. Hopwood, Mount Lebanon, assignor to Hagan Corp.

2,496,770. **In a Flexible Mounting Including an Elongated Member with Walls Between Which Is an Elongated Bar, Elongated Rubber Members under Compression in the Recesses Formed on Either Side between Wall and Bar.** J. R. Bennett, Wabash, Ind., assignor to General Tire & Rubber Co., Akron, O.

2,496,878. **Sealing Closure for Adjacent Margins Having a Slot between Them Terminating in a Closed End.** C. P. Krupp, Barberton, O., assignor to B. F. Goodrich Co., New York, N. Y.

2,496,893. **Pneumatic Suspension Device for Interposition between a Pair of Relatively Movable Elements Including a Resilient Case in Which Is a Bladder Having an Inflation Valve.** A. F. Smith, Brooklyn, N. J.

2,496,932. **Anti-Skid Tire with Rows of Short Helical Spring Elements Disposed in Layers of Rubber in the Tread.** C. J. Burkley, assignor to Wingfoot Corp, both of Akron, O.

2,497,006. **Molded Rubber Protector for Dispensing Hose Valves.** D. A. and J. E. McCoy, Jr., both of Hamlin, Tex.

2,497,123. **In a Fuel Cell, a Laminated Fuel-Resistant Wall Including a Layer of Rubber-Like Material That Swells on Contact with the Fuel and a Layer of Fuel Resistant Synthetic Rubber.** P. K. Frolich, Westfield, N. J., assignor to Standard Oil Development Co., a corporation of Del.

2,497,250. **Sole Having a Raised Supporting Portion on Its Upper Face.** H. L. Whitman, East Bridgewater, Mass., assignor to B. F. Goodrich Co., New York, N. Y.

2,497,443. **Thin-Walled, Hollow, Form-Fitting Pad for Applying Heat to a Portion of the Human Body.** J. N. Eatman, St. Augustine, Fla.

2,497,518. **Tire Tread Having Rectangular Shaped Suction Cups around the Tire.** E. A. Salcy, Allston, Mass.

2,497,528. **Waterproof Stocking and Shoe Protector.** W. E. Baker, Baltimore, Md.,

2,497,555. **Toy Rubber-Band Gun.** A. Miller, Monongahela, Pa.

2,497,609. **Splash Guard for Shoe Heels.** C. F. Hoover and J. Nissley, both of Harrisburg, Pa.

2,497,623. **In a Flexible Coupling for Driving and Driven Shafts, Including a Pair of Metal Disks, a Resilient Rubber Disk between the Metal Disks, and Vulcanized thereto.** H. Nolen, Birmingham, Ala.

2,497,637. **Laminates of Fabric and Polymers of Alkenyl Esters of Arylphosphonic Acids.** A. D. F. Toy, Chicago, Ill., assignor to Victory Chemical Works, a corporation of Ill.

2,497,674. **In a Window Washer, a Rubber Bulb Detachably Mounted on a Tubular Handle to Hold and Propel Liquid through This Handle to a Head Receptacle at the Other End of the Handle.** U. Kolchinsky, Atlantic City, N. J.

2,497,772. **Elastic Pull Lines for a Pack-Type Parachute.** J. W. Horning, assignor of one-half to C. H. Evert, both of Bloomsburg, Pa.

2,497,857. **Amphibious Equipment for Vehicles Including Detachable Form-Fitting Flexible Water-Repellent Slip Cover.** A. H. Benson, Hopewell, N. J.

2,497,892. **Bathing Cap.** A. Klar, New York, N. Y.

2,497,922. **In a Flexible Electrical Transmission and Pressure Line, Including an Insulated Conductor Surrounded by a Second Insulated Conductor, and Metal Couplings at Each End of the First Conductor, a Flexible Air Tube Surrounding the Second Conductor and Sealed to the Couplings.** T. H. Batt, Westfield, N. J., assignor to Western Electric Co., Inc., New York, N. Y.

2,498,348. **In a Marine Propeller, a Rubber Shell Surrounding the Hub Core and a Blade-Shaped Rubber Shell Surrounding Each of a Number of Inserts Integral with the Hub Core.** F. E. Thompson, Jr., Grand Rapids, Mich.

2,498,359. **Plunger Pump.** M. W. Coleman, Dearborn, Mich.

2,498,437. **Flexible Boot with Front and Rear Reinforcing Strips.** L. H. L'Hollier, Waltham, Mass., assignor to B. F. Goodrich Co., New York, N. Y

CHEMICAL

United States

2,498,593. **Daylight Fluorescent Resinous Sheeting Materials.** J. L. Switzer, Cleveland Heights, and R. C. Switzer, South Euclid, both in O.

2,498,602. **Plasticized Vinyl Resin Composition.** J. Dazzi and C. H. Rector, Jr., both of Dayton, O., assignors to Monsanto Chemical Co., St. Louis, Mo.

2,498,605. **New Composition Including a Mixture of Maleic Anhydride or Succinic Anhydride and a Polymer of at Least 70% of Acrylonitrile.** G. E. Ham, Dayton, O., assignor to Monsanto Chemical Co., St. Louis, Mo.

2,498,616. **Resinous Polymerization Products of Styrene.** W. S. Emerson, Dayton, O., assignor to Monsanto Chemical Co., St. Louis, Mo.

2,498,617-619. **Polyglycol Products, Polyglycol Sulfate Salts and Polyglycolsulfonic Acid Salts of Diaminodiphenyl Sulfone.** E. W. Gluesenkamp, Centerville, O., assignor to Monsanto Chemical Co., St. Louis, Mo.

2,498,621. **Low-Density, Cellular Resin Produced from a Mixture Including an Unsaturated Alkyd Resin and a Copolymerizable Liquid from the Group of Styrene, Alkyl-Substituted Styrenes and Chlorinated Styrenes.** E. L. Kropa, Old Greenwich, Conn., L. E. Craig, Easton, Pa., and A. S. Nyquist, Cos Cob, Conn., assignors to American Cyanamid Co., New York, N. Y.

2,498,638. **For a Cork Composition a Resinous or Proteinaceous Binder and a Paraffin Solution Containing a Rubber-Like Copolymer of an Open-Chain Aliphatic Conjugated Diolefin and Alpha-Methyl-Para-Methyl-Styrene.** J. W. Baymiller, Manheim Township, assignor to Armstrong Cork Co., Lancaster, both in Pa.

2,498,694. **Preparing Stable Aqueous Resin Dispersions by Polymerizing Lower Alkyl Acrylate and a Mixture thereof with Acrylonitrile, in the Presence of Ammonium Alginate.** W. C. Mast, Philadelphia, Pa., assignor to the United States of America, as represented by the Secretary of Agriculture.

2,498,712. **Paint Including an Aqueous Colloidal Dispersion of a Polymer Composed of a Mixture Including a Monovinyl Aromatic Hydrocarbon of the Benzene Series and Butadiene or Isoprene, Pigment, Emulsifying Agent, and Protective Colloid.** L. L. Ryden, assignor to Dow Chemical Co., both of Midland, Mich.

2,498,792. **An Aqueous Emulsion of Polyvinyl Acetate, Containing an Alkaline Salt of the Sulfonation Products of Alkylated Polynuclear Compounds and, as Protective Colloid, a Polypeptide.** E. C. Cottet and R. L. F. Chazal, Lyon, assignors to Societe des Usines Chimiques Rhone-Poulenc, Paris, both in France.

2,498,931. **In the Manufacture of Rubber-Like Products, Compounding with a Copolymer of Butadiene and Isoprene, Styrene or Acrylonitrile, a Sulfur-Sulfide Gum Compounded with a Dithiocarbamate; This Gum Is Produced by Reacting a Dispersion of Sulfur in an Aqueous Sodium Monosulfide Solution with Ethylene Dichloride.** H. P. Wagner, Atlanta, Ga.

2,498,999. **Isobutylene.** W. C. Offutt, Oakmont, assignor to Gulf Research & Development Co., Pittsburgh, both in Pa.

2,499,009. **Chlorosilanes.** G. H. Wagner, Kenmore, N. Y., assignor to Linde Air Products Co., a corporation of O.

2,499,097. **Thermoreversible Gels of Hydrolyzed Vinyl Fluoride/Vinyl Acetate Copolymers.** B. W. Howk and L. Plambeck, Jr., assignors to E. I. du Pont de Nemours & Co., Inc., all of Wilmington, Del.

2,499,187. **Polymer of 2-Vinyldibenzothiophene.** R. G. and L. W. Flowers, both of Pittsfield, Mass., assignors to General Electric Co., a corporation of N. Y.

2,499,275. **Making a Furfuryl Alcohol Resinous Product.** P. L. McWhorter, Odessa, assignor to Haveg Corp., Newark, both in Del.

2,499,373. **Melamine and Condensation Products thereof.** C. P. Dyer, Winchester, Mass., assignor to Monsanto Chemical Co., St. Louis, Mo.

2,499,486. **Self-Sustaining Film of Improved Clarity Formed of a Composition Including Polyethylene Compounded with Di-2 Ethyl Hexyl Phthalate and Carnauba Wax.** E. D. Fuller assignor to Visking Corp., both of Chicago, Ill.

2,499,503. **Vinyl Resin Stabilized with a Penta Alkali-Metal Pentaalkyl Tripolyphosphate.** C. E. Huff and G. A. Zimmerman, both of Mishawaka, Ind., assignors to United States Rubber Co., New York, N. Y.

2,499,526. **Thermoplastic Composition of Improved Electrical Characteristics Including Cellulose Propionate Plasticized with a Non-Polar Hydrocarbon.** J. H. Prichard, Springfield, and L. S. Birnbaum, Newark, N. J., assignors to Celanese Corp. of America, a corporation of Del.

2,499,561. **Aromatic Halosilanes.** A. J. Barry, assignor to Dow Corning Corp., both of Midland, Mich.

2,499,588. **Aqueous Dispersions from Flocculated Rubber Obtained by Treating Rubber Latex Skim.** I. Kemp, assignor to Revertex, Ltd., both of London, England.

2,499,627-628. **Preparation of 2-Mercapto, 5-Chloro-Benzothiazole.** L. A. Brooks, Fairfield, Conn., assignor to R. T. Vanderbilt Co., Inc., New York, N. Y.

2,499,774. **Pretreatment of Fibrous Textile Materials with a Thiosalicylic Acid Compound Containing a Carboxyl Group in Ortho Position to an SH Group to Improve Adhesion to Rubber.** F. S. Perkerson, assignor, by mesne assignments, to Callaway Mills Co., both of La Grange, Ga.

2,499,756. **Composition Including a Blend of an Ethylene Polymer with a Paraffin Hydrocarbon Obtained by the Catalytic Hydrogenation of Carbon Monoxide.** R. A. Jacobson, Landenberg, Pa., assignor to E. I. du Pont de Nemours & Co., Inc., Wilmington, Del.

2,499,796. **Process of Producing Polymeric Styrene in the Form of a Solid, Light-Colored Rubbery Resin.** J. D. Surmatis, assignor, by mesne assignments, to Chemical Development Corp., both of Boston, Mass.

2,499,865. **Preparation of Liquid Alkyl Silicones.** R. K. Iler, Cleveland Heights, O., assignor to E. I. du Pont de Nemours & Co., Inc., Wilmington, Del.

2,499,932. **Plasticized Composition Including a Polyamide Resin Which Is the Reaction Product of at Least Four Different Amide-Forming Reactants.** G. R. Sido, Springfield, Mass., assignor to Monsanto Chemical Co., St. Louis, Mo.

2,500,023. **Polymerization of Substituted Ethylenes Containing Organic Coloring Matter in the Presence of Azo Compounds.** R. E. Bruk, assignor to E. I. du Pont de Nemours & Co., Inc., both of Wilmington, Del.

2,500,025. **Polymer Obtained by Copolymerizing p-Acetylamino Styrene and Acrylonitrile.** J. B. Dickey and T. E. Stanin, assignors to Eastman Kodak Co., all of Rochester, N. Y.

2,500,054. **Liquid Urea Formaldehyde Adhesive Compositions.** L. R. Anthony, Hildenborough, B. Frenkel, Southborough, C. E. Smith, Tonbridge, and R. W. H. Wicking, assignors to British Resin Products, Ltd., both of London, all in England.

2,500,082. **Reacting High Molecular Weight Styrene-Isobutylene Copolymer with Stearyl Chloride in the Presence of Aluminum Chloride as Catalyst, and in the Presence of an Inert Non-Aqueous Solvent, Hydrolyzing and Removing Residual Catalyst, and Distilling the Reaction Products to Obtain Stearyl Styrene-Isobutylene Copolymer.** E. Lieber, New York, N. Y., and W. H. Smyers, Westfield, N. J., assignors tc Standard Oil Development Co., a corporation of Del.

2,500,113. **Moldable Condensation Products of Silvered Formaldehyde.** R. M. Banks, New York, N. Y., and R. B. Barnes, Stamford, Conn., assignors to American Cyanamid Co., New York.

2,500,121. **Copolymer Obtained by Polymerizing a Mixture of 26.6 Molecular Parts of 1-Acetoxy-2-Chlorobutadiene-1,3 and 73.4 Molecular Parts of Acrylonitrile.** J. B. Dickey, Rochester, N. Y., N. J. Bowman, Gary, Ind., and C. G. Stuckwisch, Wichita, Kan., assignors to Eastman Kodak Co., Rochester.

2,500,149. **In the Sulfonation of Copolymers of Monovinyl- and Polyvinyl-Aromatic Compounds, the Improvement of Swelling the Copolymer by Contact with an Organic Liquid before Reacting the Copolymer with the Sulfonating Agent.** R. F. Boyer, assignor to Dow Chemical Co., both of Midland, Mich.

2,500,152. **Production of a Vulcanized Product, Which Includes the Partial Dehydrochlorination of a Chlorinated Paraffin Hydrocarbon and Subsequent Reaction with a Vulcanizing Agent.** S. J. Cohen, Rochester, and W. E. Scheer, Jackson Heights, both in N. Y.; Scheer assignor to Cohen.

2,500,222. **Curable Alkyd Resins.** H. E. Weaver, Pittsburgh, Pa., and E. G. King, Shelton, Wash., assignors to Armstrong Cork Co., Lancaster, Pa.

2,500,229. **Solid Polymer of an Aliphatic Conjugated Diolefin of 4 to 6 Carbon Atoms Stabilized against Aging by Incorporation of Polymeric 2,2,4-Trimethyl-Tetrahydroquinoline.** J. B. Arnold and L. J. Dankert, assignors to Dow Chemical Co., all of Midland, Mich.

2,500,265. **Polymerization of Unsaturated Esters of Acrylic and Methacrylic Acids in the Presence of a Catalyst of the Class of Alkali Metal, Alkali Metal Alkyls, and Alkali Metal Hydrides, the Alkali Metal Being Sodium or Potassium.** C. T. Walling, Upper Montclair, N. J., and R. H. Snyder, Chicago, Ill., assignors to United States Rubber Co., New York, N. Y.

2,500,517. **Curing a Copolymer of Butadiene and Acrylonitrile by Heating without Sulfur in the Presence of an Ether of a Methylol Compound Including a Formaldehyde Addition Product of an Amino 1,3,5-Triazine.** T. S. Carswell, Seattle, Wash., assignor to Monsanto Chemical Co., St. Louis, Mo.

2,500,597. **Polymeric 2,2,4-Trimethyl-Tetra-Hydroquinoline.** J. B. Arnold and L. J. Dankert, assignors to Dow Chemical Co., both of Midland, Mich.

2,500,607. **Copolymers of Diallyl Phthalate with Allyl Vinyl Phthalate.** T. W. Evans, Oakland, and D. E. Adelson and L. N. Whitehill, Berkeley, assignors to Shell Development Co., San Francisco, all in Calif.

2,500,652. **Dimethyltolylchlorosilane.** A. J. Barry and J. W. Gilkey, assignors to Dow Corning Corp., all of Midland, Mich.

2,500,761. **Organo-Substituted Halogenosilanes.** R. N. Lewis, Schenectady, N. Y., assignor to General Electric Co., a corporation of New York.

2,500,780. **Low-Temperature Copolymerization of Isobutylene and a Multiolefin Which Includes Admixing a 2,4,6-Trialkylated Phenol and the Application of a Friedel-Crafts Catalyst.** C. F. Van Gilder, Roselle, N. J., assignor to Standard Oil Development Co., a corporation of Del.

2,500,843. **Composition of Urea-Formaldehyde and Organosilicon Compound.** C. A. MacKenzie, Montclair, and J. B. Rust, West Orange, both in N. J., assignors, by direct and mesne assignments, of one-half to Ellis-Foster Co., and one-half to Montclair Research Corp., both corporations of N. J.

2,500,858. **Rubber Composition Containing a Soapy Waxy Material Obtained by Oxidizing and Polymerizing Oleic Acid Mixed with a Sulfonated Vegetable Oil, and a Metal Oxide.** C. B. Pape, Montague, Mich., and J. R. Sweetman, Butler, Pa., assignors to Valley Industries, Inc., New York, N. Y.

2,500,881. **Plasticized Resin Composition Including Polyvinyl Chloride, Dicyclohexyl Phthalate and Di-(2-Ethylhexyl) Phthalate.** C. H. Alexander, Cuyahoga Falls, O., assignor to B. F. Goodrich Co., New York, N. Y.

2,500,894. **In the Distillation of Volatile Monomeric Materials from Aqueous Polymer Dispersions, the Inclusion in the Dispersion of Acetic Acid to Reduce Foam Formation during Distillation.** D. Craig, Silver Lake, O., assignor to B. F. Goodrich Co., New York, N. Y.

2,501,123. **Electrical Insulating Compound Including Natural or Synthetic Rubber, and a Bituminous Composition Consisting of a Gilsonite Derivative, Paraffin, and Microcrystalline Waxes.** T. K. Cox, Randalstown, Md., assignor to Western Electric Co., Inc., New York, N. Y.

2,501,382. **Styrene and Halogenated Styrene.** H. A. Dutcher, Bartlesville, Okla., assignor to Phillips Petroleum Co., a corporation of Del.

2,501,525. **Preparation of Polysiloxane Resin from a Mixture of Organohalogenosilanes Containing at Least 50 Mol % Methyltrichlorosilane and Free of Solvent and Capable of Forming a Resin on Hydrolysis and Condensation.** R. H. Krieble and J. R. Elliott, both of Schenectady, N. Y., assignors to General Electric Co., a corporation of N. Y.

2,501,562. **Polymerization of Styrene in the Presence of a Polyvinyl Alcohol-alkyl Aldehyde Reaction Product.** L. D. Cook, Jr., Chicago, Ill., assignor to International Detrola Corp., Detroit, Mich.

2,501,610. **Diallyl-3,5-Dimethylphthalate Polymer.** R. C. Morris, Berkeley, and A. V. Snider, Richmond, assignors to Shell Development Co., San Francisco, all in Calif.

2,501,647. **Resinous Products Derived from Haloacrylic Acid Compounds.** W. O. Ney, Jr., Easton, Pa., assignor to General Aniline & Film Corp., New York, N. Y.

2,501,651. **Acrylonitrile.** J. F. Martino, Elizabeth, N. J., assignor to American Cyanamid Co., New York, N. Y.

2,501,654. **Cement Consisting of an Alcoholic Dispersion of Reclaimed Rubber or Polychloroprene and Ethyl Alcohol Including Shellac as a Dispersing Agent.** S. L. Brams, Dayton, O., assignor to General Motors Corp., Detroit, Mich.

2,501,665-666. **Lignin Resins.** R. N. Evans and A. P. Ingrassia, assignors to Masonite Corp., all of Laurel, Miss.

2,501,693. **Homogeneous Bulk Polymerization of Ethylenically Unsaturated Organic Compounds in the Presence of a Diazo Thioether.** W. B. Reynolds, Bartlesville, Okla., and E. W. Cotten, deceased, late of Bartlesville, by R. K. Harris, administrator, Bartlesville, assignors to Phillips Petroleum Co., a corporation of Del.

2,501,783. **Water-Soluble Urea Resins.** W. L. Morgan, Haverford, Pa., assignor to Arnold, Hoffman & Co., Inc., a corporation of R. I.

2,501,896. **Dichlorovinyl Ethers.** C. Graenacher, Riehen, and E. Usteri and M. Geiger, Basel, assignors to Ciba, Ltd., Basel, both in Switzerland.

2,501,990. **Thermosetting Resin Including the Reaction Product of Formaldehyde with the Unhydrolyzed Copolymer of Vinyl Lactate and Methyl Acrylate.** T. S. Carswell, Seattle, Wash., assignor to Monsanto Chemical Co., St. Louis, Mo.

2,501,995. **Acid Resistant Molding Composition for Storage Battery Box, Including a Binder and a Resin from the Class of Partially Polymerized Furfuryl Alcohol, Phenol-furfural, Phenol-Formaldehyde, and Mixtures thereof.** E. R. Dillehay, Glen Ellyn, Ill., assignor to Richardson Co., Lockland, O.

2,502,030. **Solutions of Acrylonitrile Polymers Containing a Color-Free Acidic Compound.** R. A. Scheiderbauer, Kenmore, N. Y., assignor to E. I. du Pont de Nemours & Co., Inc., Wilmington, Del.

2,502,080. **Petroleum Resin Dispersion.** E. S. Fenelon, Jr., and E. J. Pavilonis, assignors to Hercules Powder Co., all of Wilmington, Del.

2,502,286. **In a Laminated Sheet Material, an Adhesive Layer Including a Cured Thermosetting Silicone Plasticized with a Monofluoro Alkyl Silane or a Difluoro Alkyl Silane.** F. J. Sowa, Cranford, N. J.

2,502,353. **For Producing Coated Fabrics, a First Layer of a Composition Including Polychloroprene, Coumarone Resin and Necessary Curing Agents, Retarders and Fillers, and Top Layers of a Composition Including a Copolymer of Chloroprene and Acrylonitrile, Glycerine, Maleic Anhydride and Wood Rosin.** D. J. Sullivan, Fairfield, Conn., assignor to E. I. du Pont de Nemours & Co., Inc., Wilmington, Del.

2,502,370. **Heat Fusible Composition Including a Polyvinyl Chloride Resin Containing Pentaerythritol Tetrabenzoate.** J. K. Craver, Webster Groves, assignor to Monsanto Chemical Co., St. Louis, both in Mo.

2,502,371. **Heat Fusible Composition Including Polyvinyl Chloride Resin Containing Diphenyl Phthalate.** J. R. Darby, Richmond Heights, assignor to Monsanto Chemical Co., St. Louis, both in Mo.

2,502,390. **Polyalkylthiophene.** O. M. Reiff, Woodbury, and H. J. Andress, Jr., Pitman, both in N. J., assignors to Socony-Vacuum Oil Co., Inc., a corporation of N. Y.

2,502,391. **Butadiene-Styrene Elastomer Stabilized against Oxidation by the Incorporation of Polymeric Thiophene Amine Having a Molecular Weight between 850 and 1500.** E. P. Rittershausen, Hempstead, and P. D. Sharpe, New York, both in N. Y., assignors to Socony-Vacuum Oil Co., Inc., a corporation of N. Y.

Dominion of Canada

462,384. **High Molecular Weight Interpolymer of Nuclear Substituted Dichlorostyrene and an Open-Chain Conjugated Diene.** J. C. Michalek, Niagara Falls, assignor to Mathieson Alkali Works, New York, both in N. Y., U.S.A.

462,398. **Polymerization Process for Vinylidene Compounds.** W. K. Wilson, assignor to Shawinigan Resins Corp., both of Springfield, Mass., U.S.A.

462,472. **Producing Polymers and Copolymers of Styrene Having High Viscosity in the Molten State within a Closed System.** J. Allen, Jr., and W. R. Marshall, both of Bloomfield, N. J., and G. E. Wightman, Newburgh, N. Y., both in the U.S.A., assignors to Carbide & Carbon Chemicals, Ltd., assignor to Bakelite Co. (Canada), Ltd., Toronto, Ont.

462,497. **Dithio Bis-Arylamine.** P. T. Paul and L. B. Tewksbury, Jr., both of Naugatuck, Conn., U.S.A., assignors to Dominion Rubber Co., Ltd., Montreal, P.Q.

462,540-541. **Insoluble Nitrogenous Resinous Compositions Suitable for the Absorption of Acidic Constituents from Fluids and for Ion Exchange.** J. W. Eastes, assignor to Resinous Products & Chemicals Co., assignor to Rohm & Haas, Co., all of Philadelphia, Pa., U.S.A.

462,559. **Aqueous Emulsion Polymerization of Butadiene and Mixtures of Butadiene and Styrene and Butadiene and Acrylonitrile.** B. M. Vanderbilt, Westfield, N. J., and R. F. Howe, Baton Rouge, La., assignors to Standard Oil Development Co., Linden, N. J., both in the U.S.A.

462,560. **In the Emulsion Polymerization of a Conjugated Diolefin, the Steps of Controlling and Improving Reactivity by Applying to the Diolefin in Liquid Phase a Neutral Aqueous Solution of an Oxidizing Material.** B. M. Vanderbilt, Westfield, and G. E. Serniuk, Roselle, assignors to Standard Oil Development Co., Linden, all in N. J., U.S.A.

462,579. **Emulsifying with Water Butadiene-1,3 and a Mixture of Nuclear Dichloro-Styrenes, Reacting the Substance in the Emulsified State, and Separating a Rubber-Like Copolymer.** J. C. Michalek, Niagara Falls, assignor to Mathieson Alkali Works, New York, both in N. Y., U.S.A.

United Kingdom

633,727. **Para-Vinylbenzyl Acetate, Para-Vinylbenzyl Alcohol and Polymers and Copolymers thereof.** Monsanto Chemical Co.

633,732. **Organohalosilanes.** Dow Corning Corp.

633,745. **Compositions Including Plastic Polymerized Chloroprene.** B. B. Chemical Co., Ltd.

633,786. **Stabilization of Polysulfone Synthetic Resins.** British Celanese, Ltd.

633,814. **Maleic Anhydride.** Beck, Coller & Co. (England), Ltd.

633,846. **Rubber Derivatives.** Dunlop Rubber Co., Ltd., F. A. Jones, and G. A. Truesdale.

633,849-850. **Siloxane Resins.** Dow Corning Corp.

633,876. **Synthetic Resinous Materials.** British Thomson-Houston Co., Ltd.

633,904. **Concentrated Rubber Dispersions.** Nederlandsch-Indisch Instituut Voor Rubberonderzoek.

633,923. **Manufacture of Resins from Aldehydes and Aromatic Hydrocarbons.** Dorman, Long & Co., Ltd., T. G. Woolhouse, and W. Lunn.

633,939-941. **Plasticized Synthetic Resin Compositions.** G. L. Martin Co.

633,973. **Organo-Polysiloxane Compositions.** Westinghouse Electric International Co.

634,077. **Poly-N-Vinyl Pyrrole Compounds Molding Composition.** General Aniline & Film Corp.

634,140 **Hydrolyzed Ethylene Interpolymers.** Imperial Chemical Industries, Ltd.

634,172. **Polyamide Condensation Polymers.** Wingfoot Corp.

634,183. **Esters of Polyoxyalkylene Diols.** Carbide & Carbon Chemicals Corp.

634,216. **Polyvinyl Acetate Emulsions.** A. H. Stevens (Shawingan Resins Corp.)

634,235. **Polyamides.** E. I. du Pont de Nemours & Co., Inc.

634,241. **Dispersions of Halogenated Rubber.** Rubber-Stichting.

PROCESS

United States

2,499,134. **Providing Adhesion between Two Surfaces.** N. A. de Bruyne, Duxford, England, assignor, by mesne assignments, to Rohm & Haas Co., Philadelphia, Pa.

2,499,344. **Making Golf Balls.** R. F. Smith, assignor to Worthington Ball Co., both of Elyria, O.

2,499,724. **Producing a Composite Structure of Natural and Synthetic Rubbers.** J. Compton, Cuyahoga Falls, O., assignor to B. F. Goodrich Co., New York, N. Y.

2,500,053. **Joining Pieces of Plastic.** A. M. Andrews, Portland, Oreg.

2,500,352. **Treating Rubber prior to Extrusion.** A. C. Fulton, assignor to Dunne Rubber Co., both of Ashtabula, O.

2,500,494. **Casting Rubber Articles.** D. M. Jeffers, assignor to Jeffers Mfg. Co., both of Fresno, Calif.

2,500,523. **Manufacturing Wire Cord.** M. A. Crosby and E. L. Luaces, assignors to Dayton Rubber Co., all of Dayton, O.

2,500,573. **Making Roll Coverings.** J. Rockoff, Dayton, O., assignor to Dayton Rubber Co., a corporation of O.

2,500,603. **Producing Expanded Rubber Material.** L. Cooper, Milford, Conn., and H. Pfleumer, New Brunswick, N. J., assignor to Rubatex Products, Inc., New York, N. Y.

2,500,728. **Producing Resin Sheets by Continuously Polymerizing Monomeric Material.** E. G. Williams, Lemsford, England, assignor to Imperial Chemical Industries, Ltd., a corporation of Great Britain.

2,501,644. **Building Steel Cable Tire Ply Bands.** H. T. Kraft, Akron, and W. C. McCoy, Shaker Heights, assignors to General Tire & Rubber Co., Akron, both in O.

2,501,868. **Making a Dielectric Material from Polystyrene and a Comminuted Inorganic Dielectric Material.** F. B. Hodgdon, Salt Lake City, Utah, assignor to Western Electric Co., Inc., New York, N. Y.

2,501,988. **Treating Fabric, Yarns, Etc., to Render Rubberized Articles Made therefrom More Durable.** M. R. Buffington, Millburn, assignor to Lea Fabrics, Inc., Newark, both in N. J.

2,502,240. **Heavy-Gage Articles from Thin Thermoplastic Sheet Material.** F. E. Wiley, Leominster, Mass., assignor to Plax Corp., Hartford, Conn.

2,502,304. **Forming Expanded Plastic Materials.** W. O. Baker, Morristown, N. J., assignor to Bell Telephone Laboratories, Inc., New York, N. Y.

MACHINERY

United States

2,498,670. **Extrusion Device.** L. E. Gaenzle, assignor to Armstrong Cork Co., both of Lancaster, Pa.

2,498,953. **Tire Tread Applying Machine.** E. A. Glynn, assignor to Super Mold Corp. of California, both of Lodi, Calif.

2,499,359. **Machine for Flaking Plastic Material.** H. F. Cox, Jr., assignor to American Can Co., both of New York, N. Y.

2,499,397. **Apparatus to Form Thin Annular Plastic Articles.** G. A. Lyon, Allenhurst, N. J.

2,499,398. **Plastics Extruder.** G. A. Lyon, Allenhurst, N. J.

2,499,399. **Apparatus for Pressing and Conveying Extruded Plastic Charges.** G. A. Lyon, Allenhurst, N. J.

2,499,565. **Mold for Forming All-Plastic Shoes.** J. J. Booth, Dallas, Tex.

2,499,888. **Apparatus for Tensioning Rubber Threads.** F. Taylor, assignor to Thomas Taylor & Sons, Inc., both of Hudson, Mass.

2,499,913. **Machine for Treating Rubber.** W. A. Gordon, Shelton, assignor to Farrel-Birmingham Co., Inc., Ansonia, both in Conn.

2,500,193. **Bead Setting and Underply Flaring Device in Tire Building Machinery.** E. E. Mallory, Cuyahoga Falls, and J. W. White, Wadsworth, O., assignors to National Rubber Machinery Co., Akron, O.

2,500,273. **Tread Splice Stitcher.** W. J. Breth, assignor to General Tire & Rubber Co., both of Akron, O.

2,500,329. **Thermoinjecting Molding Apparatus.** K. W. Hall, Toledo, O., assignor, by mesne assignments, to Baldwin Locomotive Works, a corporation of Pa.

2,501,413. **Machine for Equalizing Tension in Rubber Threads before Feeding to Thread Covering Machines.** A Schiappa, assignor to Moore Fabric Co., both of Pawtucket, R. I.

2,501,577. **Tire Repair Vulcanizer.** P. O. Pfeiffer, assignor to General Tire & Rubber Co., both of Akron, O.

2,501,584. **Apparatus to Form Annular Tubular Bodies.** G. H. Schanz, Akron, O., assignor to B. F. Goodrich Co., New York, N. Y.

2,501,595. **Plastics Molding Machine.** G. S. Bohannon, assignor to Crown Machine & Tool Co., both of Fort Worth, Tex.

2,501,672. **Dipping Tank for Coating Articles.** F. L. Gerin, Montclair, N. J., assignor, by mesne assignments, to Specialties Development Corp., Belleville, N. J.

2,501,863. **Apparatus for Molding Articles.** T. K. Cox, Randalstown, Md., assignor to Western Electric Co., Inc., New York, N. Y.

UNCLASSIFIED

United States

2,499,028. **Rubber Mold Lubricant.** W. G. Kunze, Catonsville, Md.

2,500,531. **Inner Tube Valve.** E. Eger, Los Angeles, Calif., assignor to United States Rubber Co., New York, N. Y.

2,501,191. **N,N'-Polythioamines as Pesticides.** W. D. Stewart and J. H. Standen, both of Yonkers, assignors to B. F. Goodrich Co., New York, both in N. Y.

2,501,801. **Combined Tire Inflating Pressure Regulator, Pressure Gage, and Valve Device.** H. S. Wallin, Los Angeles, Calif.

2,501,859. **Spacer for Use between Rubber Sheets during Vulcanization.** B. J. Babbitt, Riverside, and G. R. Simmons, Chicago, both in Ill.

2,501,937. **Inflation Device for Safety Tubes.** C. U. Gramelspacher, Jasper, Ind.

2,502,301. **Oral Inflation Valve.** S. W. Alderfer, assignor to Andrews-Alderfer Processing Co., Inc., both of Akron, O.

TRADE MARKS

United States

443,657. **Feathernap.** Undergarments. I. B. Kleinert Rubber Co., Inc., New York, N. Y.

433,733. **Mirrakaf.** Impregnated rolls and sheets for footwear use. Middletown Rubber Corp., Middletown, Conn.

433,757. **Velex.** Films and sheets of plastics and/or resins. Firestone Tire & Rubber Co., Akron, O.

443,804. Representation of an oval containing the word: **"Covinpressor."** Tire inflating pump. M. Covins, doing business as Danville Mfg. Co., Danville, Ill.

443,805. Representation of an octagon containing the letters: **"CD."** Tire inflating pump. M. Covins, doing business as Danville Mfg. Co., Danville, Ill.

443,812. **Tallads.** Footwear. Adler Sons Shoe Corp., New York, N. Y.

443,817. **ProtacotE.** Protective coating. C. F. Brown, Bethany, W. Va.

443,845. **Plyon.** Thermoplastic material. Press-On, Inc., New York, N. Y.

443,846. **Leathertone.** Artificial leather. Textileather Corp., Toledo, O.

443,865. **Air-O-Flater.** Tire inflater. General Air Products Corp., Chicago, Ill.

514,179. **Mongol.** Rubber bands, erasers, fountain pens, etc. Eberhard Faber Pencil Co., Brooklyn, N. Y.

514,221. **Loma-Loom.** Sponge rubber backed carpets and rugs. Weil Bros. Textiles, Inc., New York, N. Y.

514,236. **Poro-Cel.** Rubbery hydrophobic sheet material for waterproof clothing, etc. Minnesota Mining & Mfg. Co., St. Paul, Minn.

515,845. Representation of a circle containing the words: **"Armstrong Cork Company"** and an inner circle containing the letter: **"A."** Floor tiling. Armstrong Cork Co., Lancaster, Pa.

515,862. Representation of fanciful letters: **"T"** and **"H"** and the word: **"Garnet."** Coated abrasive products. Armour & Co., Chicago, Ill.

515,875. Representation of an oval containing the word: **"Inland."** Cleaners and solvents for rubber articles. Inland Rubber Corp., Chicago, Ill.

515,944. **Hart Schaffner & Marx.** Raincoats. Hart Schaffner & Marx, Chicago, Ill.

515,945. Representation of a rectangle containing a mounted costumed trumpeter and the words: **"Hart Schaffner & Marx."** Raincoats. Hart Schaffner & Marx, Chicago, Ill.

515,960. **Wilbur Coon Shoes.** Footwear. W. B. Coon Co., Rochester, N. Y.

515,975. Representation of an armored soldier and the word: **"Armor-Flex."** Auto pedals. Doan Mfg. Corp., East Cleveland, O.

516,056. Representation of an oval containing the word: **"Gates."** Aprons. Gates Rubber Co., Denver, Colo.

516,124. **Winfield.** Sporting goods. F. W. Woolworth Co., New York, N. Y.

516,128. **Cri-Baby.** Dolls. Ideal Novelty & Toy Co., Hollis, N. Y.

516,200. **Priscilla.** Bath mats. Beh & Co., Inc., New York, N. Y.

516,210. **Roesheath.** Wire and cable. John A. Roebling's Sons Co., Trenton, N. J.

516,230. Representation of a diamond containing the word: **"Cornish."** Wire and cable. Cornish Wire Co., Inc., New York, N. Y.

516,241. Representation of a circle containing the words: **"Bull Dog"** and a rectangle containing the letters: **"BWH"** and a representation of a bull dog. Friction tape. Boston Woven Hose & Rubber Co., Cambridge, Mass.

516,344. **Royalene.** Synthetic plastic. United States Rubber Co., New York, N. Y.

516,364. **Litentuf.** Footwear. B. F. Goodrich Co., Akron, O.

516,386. Representation of a seal containing the words: **"Seal Fast"** and above which is the word: **"Bowes."** Tire wall paint and auto top finish. Bowes "Seal-Fast" Corp., Indianapolis, Ind.

516,408. Representation of a black cat. Footwear. Cat's Paw Rubber Co., Inc., Baltimore, Md.

516,426. **Woodrow.** Raincoats. Woodrow Stores, Inc., New York, N. Y.

516,430. **Steelbestos.** Gaskets. Detroit Gasket & Mfg. Co., Detroit, Mich.

516,436. Representation of a section of belting containing the words: **"Lapless Endless."** Belting. Ton-Tex Corp., Grand Rapids, Mich.

516,452. **Borhide.** Footwear. Allen Edmonds Shoe Corp., Belgium, Wis.

516,464-65. **American Brakeblok.** Frictional elements for brakes, clutches, fan belts, etc. American Brake Shoe Co., New York, N. Y.

516,466. **American Brakebloks.** Frictional elements for brakes and clutches. American Brake Shoe Co., New York, N. Y.

516,478. **Lady Milford.** Garters and hose supporters. A. J. Donahue Corp., Milford, Conn.

516,480. **Conway.** Footwear. Marshall Field & Co., Chicago, Ill.

516,490. Representation of an armored soldier and the word: **"Armor-Flex."** Mechanical rubber goods. Doan Mfg. Corp., Cleveland, O.

516,503. **Ease-All.** Mats. S. M. Allwell, doing business as Ease-All Rubber Products, East Orange, N. J.

516,520. Representation of a rectangle within a rectangle—all in black and yellow. Hose. National Cylinder Gas Co., Chicago, Ill.

516,525. **Victor.** Gaskets and parts therof. Victor Mfg. & Gasket Co., Chicago, Ill.

516,531. **Kel-F.** High-temperature thermoplastic. M. W. Kellogg Co., Jersey City, N. J.

516,541. **Belro.** Resin. Hercules Powder Co. Wilmington, Del

516,601 Representation of a rectangle containing the word: **"Pro-Line."** Washers and gaskets. H. P. Canfield Co., Bridgeport, Conn.

516,607. **Air-float.** Tires. Gates Rubber Co., Denver, Colo.

516,609. **Workwell.** Belting. Victor Balata & Textile Belting Co., New York, N. Y.

516,611. **Supplex.** Hose. Industrial Synthetics Corp., Garwood, N. J.

516,616. **Claw-Grip.** Tire casings. Seiberling Rubber Co., Barberton, O.

516,656. **PolkiDOT by Hoe Crampton.** Baby pants. Hope Crampton, New York, N. Y.

516,678. **Hyvatex.** Rubberized sheeting. Holland-Rantos Co., Inc., New York, N. Y.

516,699. **Worthington.** Golf balls. Worthington Ball Co., Elyria, O.

516,726. Representation of a circle containing the words: **"Uni Form."** Softballs. A. G. Spalding & Bros., Inc., Chicopee, Mass.

516,729. **Acushnet.** Golf balls. Acushnet Process Co., New Bedford, Mass.

516,779. **Diaper Bowl Champ.** Footballs. Franklin Mfg. Co., Inc., Brockton, Mass.

516,780. **Gridiron Champ.** Footballs. Franklin Mfg. Co., Inc., Brockton, Mass.

516,781. **Junior Touch Champ.** Footballs. Franklin Mfg. Co., Inc., Brockton, Mass.

516,782. **Touch Champ.** Footballs. Franklin Mfg. Co., Inc., Brockton, Mass.

516,820. **Resilite.** Coated abrasive products. Armour & Co., Chicago, Ill.

516,872. Representation of a crown and the word: **"King-O-Ball."** Balls. George E. Mousley, Inc., New York, N. Y.

516,873. **Balloonie.** Toy balloon animals. Oak Rubber Co., Ravenna, O.

516,878. **Firecracker.** Balloons. Bayshore Industries, Inc., Elkton, Md.

516,880. **Young Colony.** Footwear. B. Altman & Co., New York, N. Y.

516,893. Representation of a geometric figure containing a castle and the word: **"Helsingborg."** Balls and football bladders. Helsingborgs Gummifabriks Aktiebolag, Helsingborg, Sweden.

516,985. **Reylon.** Elastic. Hughes Fawcett, Inc., New York, N. Y.

517,004. Representation of an oval containing the word: **"Butyl."** Synthetic rubber. Standard Oil Co. of New Jersey, Wilmington, Del., now by change of name, Esso Standard Oil Co.

517,031. **"Strap-O-Moc."** Footwear. Shoes Associated, Inc., New York, N. Y.

517,069. **Richard Brothers.** Rubber strippers. Allied Products Corp., Detroit, Mich.

517,137. **Godchaux's.** Footwear. Leon Godchaux Clothing Co., Ltd., New Orleans, La.

517,146. **Hickok.** Garment supporters, suspenders, and garters. Hickok Mfg. Co., Inc., Rochester, N. Y.

517,147. **Action Bak.** Suspenders. Hickok Mfg. Co., Inc., Rochester, N. Y.

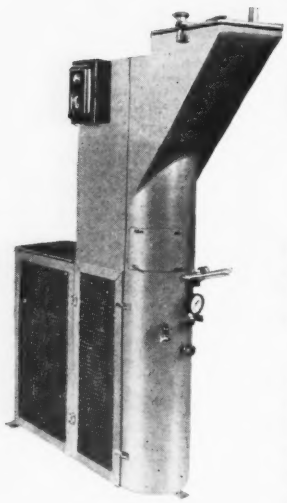
517,340. **Weaver.** Tire tools, etc. Weaver Mfg. Co., Springfield, Ill.

517,364. Representation of a six-sided figure containing the letter: **"I"** in a similar figure and the word: **"India."** Storage batteries. General Tire & Rubber Co., Akron, O.

517,380. Representation of the sun and the words: **"Flexton Plastiquilt."** Diaper bags. Veriplast, Inc., New York, N. Y.

517,437. **Naturalux.** Artificial casings of rubber hydrochloride. Milprint, Inc., Milwaukee, Wis.

517,438. **Mel O-Casing.** Astificial casings of rubber hydrochloride. Milprint, Inc., Milwaukee, Wis.



Campbell Model 1404-8 Soapstoner

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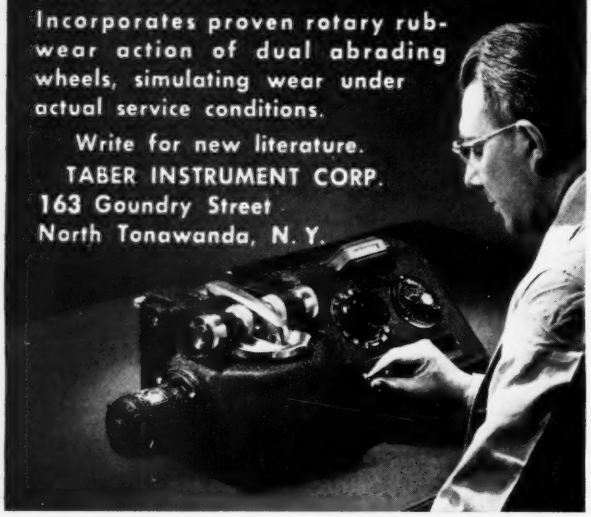
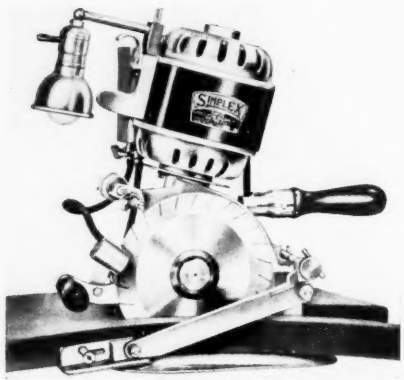


New Machines and Appliances



Simplex Model RB-2 Rubber Strip Cutter

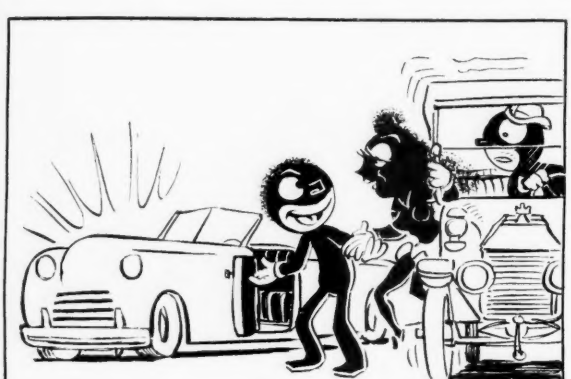
Rubber Strip Cutter

A NEW and larger rubber strip cutter, Model RB-2, is now being produced by Simplex Cloth Cutting Machine Co., 270 W. 39th St., New York 18, N. Y. The cutter was originally developed by Simplex during the war to speed up the cutting of rubber strips for gaskets and to reduce the high rejection losses resulting from older methods of cutting. The original model developed by the company had a maximum cutting thickness of one inch.

The new Model RB-2 has a maximum cutting thickness of two inches, weighs 44.5 pounds, and is available in both A.C. and D.C. types. Manually operated, the machine is capable of cutting up to 20,000 feet of rubber strip in eight hours. A series of slits in the edge of the cutting wheel carries water from a reservoir into the cut and not just to the top of the rubber being cut. This method lubricates the entire cut and produces a straight and even edge. Orders require at least a month before delivery.

Improved Abrasion Tester

AN IMPROVED abrasion testing machine, the Model 140 Abraser, has been developed by Taber Instrument Corp., North Tonawanda, N. Y. The new model incorporates the



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SEE PAGE 618

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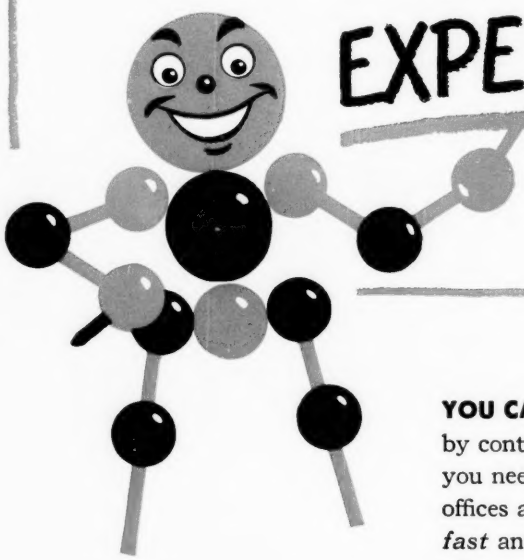

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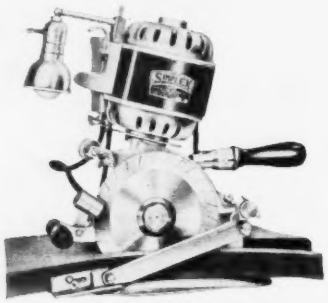

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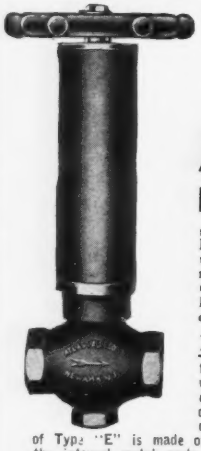

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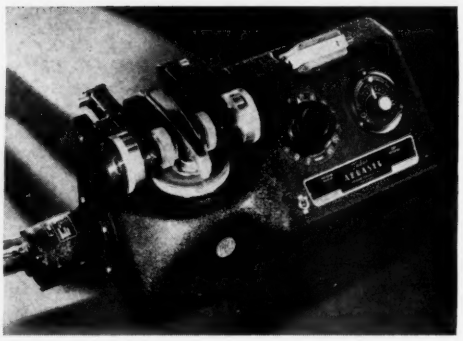

Taber Abraser Model 140

same rotary rub-wear action of dual abrading wheels of previous machines made by the company, but features a number of improvements, including sturdier shafts, larger ball bearings, capacitor-type motor with heavy-duty worm gear drive, extra-powerful vacuum unit with dual suction nozzle for high-efficiency pickup of abrading, and an electric counter for registering the wear cycles.

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Glass Fiber Reinforcement

(*Continued from page 673*)

of various percentages of glass fiber on tensile strength of this particular foam rubber. Similar results have been obtained with several other kinds of foam rubber.

Summary

A novel method of reinforcing foamed rubber latex and products made from such reinforced latex has been developed. This reinforcement is accomplished through incorporation of hammer-milled glass fiber of appropriate dimensions.

The characteristics of foams are changed somewhat through incorporation of glass fiber. The most pronounced effects, however, are apparent in vulcanized foam rubber products prepared from glass fiber reinforced foamed latex. Among physical properties of interest from such reinforced products are greatly reduced shrinkage during curing and drying, increased resistance to compression, and increased tensile strength. These results are achieved with no obvious effects on cell structure or porosity of finished products for the compositions tested.

The practical aspects of glass fiber reinforcement of foam rubber are many. Such reinforcement offers a means of control of shrinkage, reduction of sidesway in foam rubber cushions, increased resistance to tear under pulling forces, and a means of "tailoring" foam rubber for specific applications, where certain desirable properties are enhanced by incorporation of optimum amounts of glass fiber.

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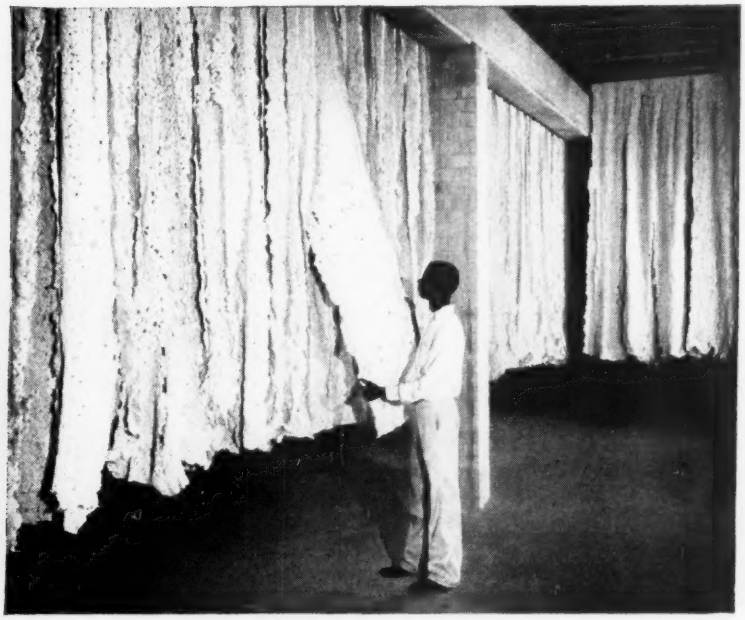

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EUROPE

FRANCE

Visit to Institut Français du Caoutchouc

L. THACKER
Foreign News Editor

PARIS, JUNE 7: I arrived in Paris on the evening of Sunday, June 4, and arranged to visit the Institut Français du Caoutchouc on Wednesday, June 7, where I was duly received by Dr. J. le Bras.

As you enter the building, you cannot help noticing the sponge rubber backed carpeting on the wide steps in the entry and in the halls, which is very soft and springy under foot. The reception room in which I was received is a spacious cool-looking room with an air of simple elegance. The library and the council room, which I was shown later on, were equally attractive in their way, and I was not surprised to learn from Dr. le Bras that the building (which was bought in 1939 with financial aid from the British Rubber Development Board and the Rubber Stichting, who, I may add, have since waived their rights so that the I. F. C. is sole owner) had originally been a private mansion. The layout was very well suited for the purposes of the I. F. C., but the building has proved to be too small. Already adjoining premises have had to be leased, and it is now also planned to build an extension into the back garden to house additional laboratories, Dr. le Bras said. As he explained it, the I. F. C. is the only organization in France devoted exclusively to the interests of rubber, and it has to undertake education and research work, testing, and the publication of *Revue Générale du Caoutchouc* and other publications dealing with rubber. This policy is in contrast to the Dutch and British institutions which can share the work with other rubber organizations in their respective countries.

Dr. le Bras told me that he will represent the I. F. C. at the meeting of the Division of Rubber Chemistry, A. C. S., in Cleveland, O., in October and that he will present two papers, "Reinforcement of Latex" and "A New Method of Measuring Hysteresis." In the latter M. R. Thirion collaborated.

In discussing the progress being made with specification rubber, Dr. le Bras emphasized that manufacturers should realize that the system constituted a first step in a new direction, in an attempt to meet the needs of the manufacturers of rubber goods. It requires cooperation and understanding of purpose and method among planters, on one hand, and understanding of its limitations on the other. Widespread adoption of the system by producers and acceptance by consumers should provide indications of manufacturers preferences, to permit further steps in the matter.

As the idea came from Indo-China rubber planters in the first place, it is natural to expect most cooperation there; apart from this fact the system would in any case have a better chance in this territory than in other Eastern rubber centers since rubber-growing is concentrated chiefly in the hands of comparatively few large companies operating extensive estates. The smallholder who plays such an important part in the industry in Malaya and Indonesia is negligible in Indo-China. The area of rubber in the hands of Indo-China smallholders has always been unimportant and has shrunk still further in the past few years. Dr. le Bras said that four companies besides the Rubber Research Institute in Indo-China are already producing specification rubber, and he looks for a total output of around 20,000 tons of this rubber in 1951.

In Malaya several groups also are preparing to use the method, and in the hands of the larger companies it should work smoothly. To what extent the smaller, and more particularly the Asiatic-owned estates and smallholdings are willing and able to cooperate is another matter. The problem is still more complicated in Indonesia.

I asked Dr. le Bras what progress was being made in the use of latex in France and in the production of latex in Indo-China. With reference to the first part of the question, he stated that France had been rather slow, but that interest was increasing. Consumption of latex in France, I found out later, was 2,757 long tons in 1949, which compares with a total consumption of rubber for the year amounting to about 100,000 tons. Figures for the first months of the current year are higher than for the corresponding months of 1949. Incidentally, the French consumer seems to have a very definite preference for 58/60% centrifuged latex. Production of foamed latex is rather limited, on the one hand because of the patent situation, and on the other because the Dunlop plant in France for producing foamed latex had been badly damaged in the war. The average French consumer has therefore had little, if any, chance to become acquainted with this material in furniture for the home, for instance.

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Multiple Opening
This picture is typical of multiple opening platen type presses of strain plate construction. This particular press is intended for curing rubber molded products but similar presses are used for press polishing and many like applications. The strain plates are preferred for some work because they provide greater rigidity than strain rods and prevent radiation and heat loss from steam-heated platens. A variety of accessories are available for spacing the platens, opening them, and connecting them to the steam supply. Various elevator arrangements can also be supplied for rapid loading and unloading.
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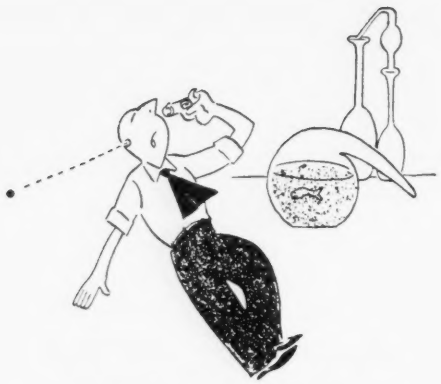

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The I. F. C. is, of course, doing a great deal to encourage the use of latex, as are the British and Dutch Institutes, and frequent "Latex Days" are organized. On June 6, just one day before my visit, such a special program was held in Paris; on June 7, a similar program was held in Lyon, and on June 9, at Toulouse. The subjects treated were: "The Advantages of the Use of Latex in the Rubber Industry," R. Houwink; "The Economic Situation of the Latex Market in the World," B. Godefroy; "The Constitution and Composition of Latex," G. M. Kraay; "Testing Preserved Latex," G. E. Van Giles; "The Manufacture of Molded Articles from Latex," F. Lepetit; "The Use of Fillers with Heat Sensitized Latex", R. Belmas; "The Reinforcement of Latex", I. Piccini; "The Flow Casting Process," G. M. Kraay; "The Manufacture of Dipped Goods from Latex," F. Lepetit; "Preparation of Sponge Rubber from Latex Using Organic Blowing Agents," and "Protection of Cellular Rubber," Ch. Pinazzi; "Application of Latex to Improving Road Surfaces," M. Duriez; "Positex," M. A. B. May; "Latex Film for Protecting Metal Surfaces," J. A. Taylor; and "Some Economic and Financial Data on the Latex Industry," by R. Houwink.

French consumption of latex may increase in the future if the latex-bitumen emulsions developed by the I. F. C. for use in road surfacing find wide application. The French authorities have been sufficiently interested to collaborate in actual road tests; the mixture has been used on several sections in the Paris area and in other parts of France, and it is understood that a long stretch of road is to be similarly treated shortly. The inclusion of latex in cold bitumen emulsions is said to make the surface less susceptible to changes in temperature, to improve aging and resistance to slipping and erosion.

As to the production of latex in Indo-China, Dr. le Bras stated that in the past this branch of the industry had not received much attention from rubber growers, but that they are now awakening to its possibilities, and about 20 centrifuges have already been installed.

M. Thirion, associate director of the I. F. C. Center of Research, conducted me through the well-equipped laboratories and testing rooms of the Institute and explained some of the projects now being worked on.

I should mention that the I. F. C. offers special training courses to elementary and advanced students, and two separate laboratories are provided where they can carry out necessary experimentation. Lectures are given at the I. F. C. or at the Sorbonne.

Much of the present research is aimed at extending the uses of the I. F. C. heat-sensitized latex, and experiments in compounding and molding the material, the use of fillers to reduce the cost of the finished articles and the reinforcement of this type of latex, have been in progress for some time. The latex, heavily loaded with chalk, has been found particularly useful for making small cheap articles, as toys, for example. M. Thirion said it was planned to work out a technique which could be passed on to small manufacturers in Indo-China.

Interesting developments, of which much seems to be expected, are the reinforcement of heat-sensitized latex with resorcinol-formaldehyde resins, and a derivative of latex and acrylonitrile. From the derivative unsupported leather-like materials of varying degrees of flexibility and hardness can be made, according to the nitrile content; also a thin fabric-backed leatherette. Manufacture of some of these materials has been started by a French firm. The reinforced latex is said to yield a product of remarkable mechanical properties, in some respects superior to those of good carbon black-reinforced dry rubber; tear resistance and tensile strength, for instance, are claimed to be better, and the modulus is higher; other properties are said to equal those of carbon black rubber. At present the use of the reinforced latex in belting is being investigated.

M. Thirion also told me about an apparatus of his own design for measuring hysteresis in which a piezo-electric quartz crystal is used to insure practically instantaneous response to the impulses of the apparatus on the rubber sample; these results then are measured with an oscillograph. The hysteresis tests are conducted at lower than 100% elongation and at low speeds of the order of a few decimeters per minute, that is, under conditions where viscosity forces are feeble and crystallization does not take place.

On the top floor of the building, in the hottest and sunniest corner, little *Hevea* plants were being grown from seed as a first step in an attempt to develop what it is hoped will prove to be a very quick method of determining the yield possibilities of a tree and to learn something about the factors influencing yield. Tiny pieces of tissue from an "eye" of the shoot are allowed to develop in different media; the structure is then studied to discover its relation to yield capacity and also the effect of the different environments. This work is still in an early stage, but if it gives encouraging results, the method will be passed on to the Rubber Research Institute in Indo-China for further experimentation.

Another piece of research work, the fruits of which will be relayed to the plantations in the Far East, aims at developing a method and apparatus for the direct and continuous conversion of latex into sheet rubber.

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Available statistics of output of all kinds of tires and tubes in France indicate a substantial increase in 1949 as compared with 1948, except in the case of cycle tires. While the output of automobile tires was 77,838 tons in 1948, it increased to 93,005 tons in 1949; automobile tubes were 8,591 tons in 1948 and 9,521 last year; airplane tires and tubes, 46 and 367 tons, respectively; cycle tires, 11,188 and 9,941 tons, respectively; and cycle tubes, 1,908 and 2,126 tons.

GREAT BRITAIN

Visit to Fort Dunlop

L. THACKER

BIRMINGHAM: As mentioned previously, J. P. Anderson, of Dunlop Rubber Co., Ltd., whom I had met in Brussels at the Rubber Study Group meeting, had suggested a trip to Birmingham and a visit to Fort Dunlop. On my arrival in London I phoned Mr. Anderson's secretary and informed her of the time I planned to reach Birmingham.

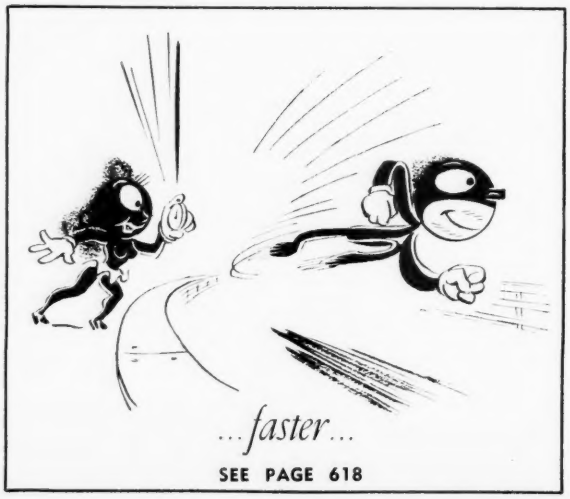
At New Street Station, Birmingham, a young lady from Dunlop was waiting to take me in her car to Fort Dunlop, where I was very kindly received by the works manager, Mr. Foster, who had arranged a program for me. Since it was still about an hour before lunch, Mr. Cogswell, his assistant, showed me as much of the plant as could be visited in that time, and the tour was then continued after lunch in the company canteen.

Fort Dunlop has a total area of about 260 acres, the plant and office buildings cover about 120. Personnel, including office and factory workers, number about 10,000.

One of the most striking things to a visitor to Fort Dunlop is the well-kept lawns and colorful flower-beds inside the gate near the entrance to the plant. Here and there employes on their lunch hour were sunning themselves on benches and enjoying the unusually fine weather prevailing at the time of my visit.

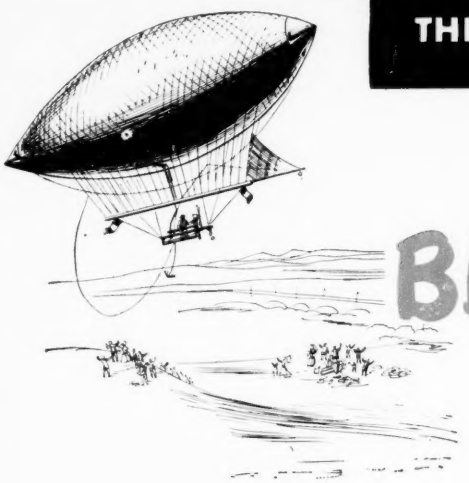
We went first through the tire factory mill room where rubber in various stages of processing was being mixed and sheeted, and the stock was being conveyed on rows of overhead traveling cranes to the various following steps in the manufacturing process.

Tire output at Fort Dunlop, Mr. Cogswell informed me, includes about 19,000 large size, 50,000 smaller passenger-car size, and 80,000 bicycle size tires a week. A difficulty with which the company has to cope is the constant need to supply a wide range of sizes in older style tires. Apparently the widespread American custom of turning in cars for newer models after a comparatively short time is not prevalent to an extent in England, and cars are run longer by the individual owners, with the result that there is a continued demand for sizes and types of tires current 10, 20, and even 30 years ago. It is therefore not surprising to learn that the company must make 90 different sizes of tires! It will also readily be understood what a problem this practice creates in the mold department where so many sizes must be kept on hand.



SEE PAGE 618

THE STORY BEHIND THE WORD...



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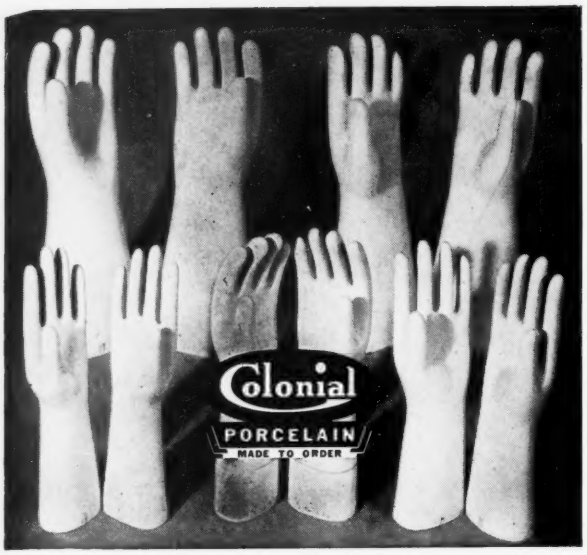

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Incidentally, tire molds are made in workshops right at Fort Dunlop, and Mr. Cogswell pointed out the difference in American and English—at any rate Dunlop—practice. Tread molds are not cast in one piece, as is the case in the United States, but in quite small sections which fit accurately into the mold shell; the advantage here is that in case of damage to any part, the whole mold does not become useless, since the affected parts can easily be removed and replaced by new parts.

Outside one of the buildings were stacks of raw rubber bales in the usual sizes weighing about 200 pounds, as well as several stacks of smaller sized bales. Dunlop now specifies bales of about 70 pounds, Mr. Cogswell explained; the advantage is that the smaller bales are less liable to stick together and are much easier to convey into the Banbury.

Lunch took place in a dining room in the company canteen; here Mr. Foster introduced me to Mr. King and several other executives. After my experience in a small, but really nice looking restaurant in London, the well-seasoned and ample meal set before me was an agreeable surprise. During the meal Mr. Foster told me something about the special tires Dunlop makes for automobile racing. The record speed over an 11-mile run, attained by an Englishman, was, he said, close to 400 miles an hour. The tires constructed for such service are made of a special compound, and they consist of a single ply since the heat and friction created by traveling at such high speeds would cause a tire made up of several plies literally to fly apart.

The pleasant lunch period ended all too soon. As we stood outside for a moment before separating to go our different ways, my eye fell on what looked like a vegetable field, and Mr. Foster, catching my puzzled glance, explained that what I was looking at was a cabbage patch, and that respectable quantities of various vegetables and fruits, including tomatoes and grapes, and actually 50 to 60 tons of potatoes, were produced annually on company land. The food is used in the company canteen, and made available to workers; and in these days of continued austerity it must provide a welcome addition to the diet of Dunlop emloyes.

Mr. Cogswell now took me to the section where the tire cord and fabric was handled. We began at the beginning where the single cords traveled and converged to form an ever more closely ranged web of cord which was then calendered with an appropriate compound and the ply thus formed wound on to a large roll between liners, all in one operation. At the stage where the cord was calendered, a single colored thread was introduced at intervals, a different color for a different quality.

British rubber goods manufacturers have in the past been burdened by a tax on liners, but now liners stamped in indelible ink with the firm's name at frequent intervals are exempt.

We also passed rolls of latex-treated and untreated rayon cord. Mr. Cogswell informed me that about 50% of the cord used at Fort Dunlop is rayon.

Our next stop was in the inner tube section, where compound was extruded, cut off into the proper lengths, then butt-welded, in most cases by hand, but in others by machine. The tubes were then transported to individual vulcanizers and finally tested under water.

The tour was concluded with a quick look into the laboratory where the testing of tire compounds was carried out.

Henley's New Cable Factory

W. T. Henley's Telegraph Works Co., Ltd., will soon open a new cable factory at Birtley, near Newcastle-on-Tyne, on a site comprising about 45 acres. The main building of the new works is single story and has a floor area of about nine acres. There is ample space for further extensions. The principal products made here will be rubber insulated electric wires and cables.

GERMANY

Kautschuk und Gummi[1] recently published a series of illustrations showing the remarkable progress various well-known rubber factories have made in emerging from the ruins to which they had been reduced by air attacks during the war. In some instances whole works divisions had to be rebuilt from the ground up and have been replaced with handsome new structures well-laid out and fitted with up-to-date equipment, with the result that productive capacity has in some cases already been brought back to prewar level, where it is not still higher. Before and after views are shown of the Vahrenwald works of Continental Werke A.G., which again employ about 4,000 workers; the hose and

[1] 3, 1, 4, (1950); 2, 39.

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When in November, 1948, the local rubber associations in the American and the British zones agreed to combine in a working federation of the German rubber industry under the name of the Arbeitsgemeinschaft der Deutschen Kautschuk-Industrie (AdK), it was hoped eventually, when conditions permitted such a step, to form a single trizonal association covering the entire rubber industry in the Western zone of Germany.

At a meeting on January 6, it was finally decided to replace the AdK with the Wirtschaftsverband der Deutschen Kautschukindustrie (WdK), the Industrial Association of the German Rubber Industry. The new organization differs from the old in two respects—it covers all three zones, and rubber manufacturers, instead of being affiliated through their local associations, have direct membership in the main association; however, the regional organizations may continue in existence as before.

Members of the WdK will elect a board of directors which will include representatives from all three zones in the West.

A transparent boat of synthetic material has been put on the market by the Wacker-Werke, Munich. The boat is constructed with a wooden framework to which is welded a transparent skin of a vinyl resin said to be very tough, largely non-inflammable, and very durable. The boat is also provided with two air chambers to prevent it from sinking. If desired, it comes with sails.

Teer Chemie A.G., Hamburg, has been appointed agent in Germany for Silicone emulsions, oils, and pastes produced by the Dow Corning Corp., Midland, Mich., U.S.A.

Kolnische Gummifadenfabrik, vorm. Ferd. Kohlstadt & Co., Koln-Deutz, in its annual report stated it has been able to resume a certain amount of manufacturing since the end of May, 1947. The works, which produce chiefly rubber thread, seem to have suffered considerably during the war and could only be rehabilitated at great expense of labor and money. However during the last year or so it has been possible to make good headway.

SWEDEN

Comparative statistics of Sweden's rubber industry in 1949 and 1948 reveal a strong development in local consumption of raw rubber accompanied by an almost equally marked decline in imports of rubber manufactures and semi-manufactures, as the following figures (in tons) show:

Imports	1949	1948
Raw rubber	22,161	14,702
Ebonite dust and waste rubber	540	1,308
Packing	387	572
Hose	627	1,281
Belting	548	1,035
Accessories for bicycles	93	554
Automobile and motorcycle tires	3,851	4,285
Tubes	397	392
Rubber footwear	102	501
Rubber-soled shoes	88	128
Other rubber goods including surgical rubber	119	131

As usual rubber footwear constituted the most important exports, but last year's figures showed a decline as compared with 1948 amounts: 184 tons, against 214 tons.

The official statistics present an interesting picture of the development of the export business in tires for motor vehicles. While only 13 tons, value 80,000 kroner, were shipped out of the country during 1948, the totals for 1949 came to 87 tons, value 455,000 kroner, of which 72 tons, value 365,000 kroner, were exported in December, 1949. These exports in January, 1950, fell to 42 tons, value 213,000 kroner, but compared with four tons, value 29,000 kroner, in January, 1949.

Tire Output from Peru

In Peru the steady rise in production of tires and tubes during 1948 was succeeded by a slump in the first half of 1949. Whereas 41,102 tires and 25,648 tubes were manufactured in the first half of 1948, and 46,078 tires and 28,527 tubes in the second half of that year, the number of tires produced in the first half of 1949 came to only 35,843 units, and of tubes, to 21,590 units.

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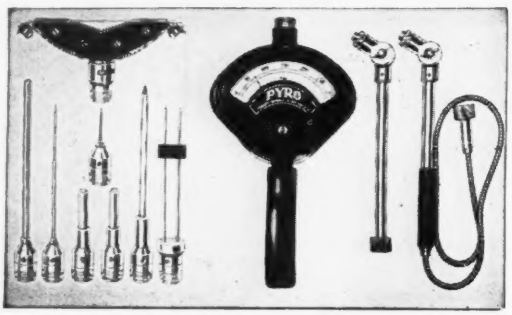

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Editor's Book Table

BOOK REVIEWS

"Frontiers in Chemistry. Volume 8. Frontiers in Colloid Chemistry." Edited by R. E. Burk and Oliver Grummitt. Interscience Publishers, Inc., 215 Fourth Ave., New York 3, N. Y. Cloth 6 by 8 inches, 1675 pages. Price, $4.

This volume concludes the publication of the lectures given at Western Reserve University under the title, "Frontiers in Chemistry." Devoted to selected topics in colloid chemistry, this book comprises the following six lectures or chapters: "The Role of Adsorption in Colloid Chemistry," Hugh S. Taylor; "Frontiers in Chromatographic Adsorption Analysis," Harold H. Strain; "Ion Exchange with Special Reference to Synthetic Resins," Robert J. Myers; "Sedimentation," V. R. Damerell; "Colloidal Electrolytes, Wetting Agents, and Detergents" and "Organization of Crystals and Micelles of Soap: Solubilization and Detergency," James W. McBain.

The subject matter is well organized and presented by each contributor and covers the particular topic through 1946. Within this time limitation, the book will be of value to students and technicians desiring some knowledge of colloid chemistry, without expecting the more comprehensive coverage of a standard text.

"Quality Control and Statistical Methods." Edward M. Schrock. Reinhold Publishing Corp., 330 W. 42nd St., New York 18, N. Y. Cloth, 6 by 9 inches, 222 pages. Price, $5.

Intended for students and beginners in the field, this book presents in simple language a thorough description of modern techniques of quality control and statistical methods as applied to industrial problems of product quality. Many illustrations and practical examples are used to clarify the text, and the coverage includes products and problems in such diverse fields as textiles, instruments, foods, electrical equipment, biologicals, mail orders, control of overtime, and public opinion polls.

The book consists of 20 chapters covering such topics as advantages of quality control and statistical methods; the meaning of numbers; summarization and presentation of data; application, interpretation, and value of the quality control chart; quality control by limit gaging; relation between control and specification limits; binomial and Poisson distributions; significance of differences in sample means and standard deviations; acceptance sampling; sequential analysis; and least squares and correlation. A glossary of terms is appended, together with a list of suggested reading and a subject index.

"Scientific and Technical Abbreviations, Signs, and Symbols." Second edition. O. T. Zimmerman and Irvin Lavine. Published by Industrial Research Service, Masonic Bldg., Dover, N. H. Cloth, 5½ by 8¼ inches, 554 pages. Price, $8.

This new edition retains the organization of the preceding book, but includes much new and revised material. In addition to presenting in convenient listings the abbreviations, signs, and symbols used in many scientific and technical fields, the volume stresses the need of greater uniformity in the use of these abbreviations. The value of this work will be evident to all scientists, and the book should contribute greatly to the crusade for standardization.

The text consists of 76 tables of abbreviations, signs, and symbols grouped into 17 sections, as follows: general abbreviations and symbols; Greek alphabet, numerical prefixes, metric abbreviations, mathematics, and statistics; chemistry, chemical engineering, physics, thermodynamics, heat flow, humidity, and radiation; mechanics, hydraulics, acoustics, and illumination; mechanical drawings, materials of construction, and shop terms; electricity, electronics, and magnetics; mapping; railway; aeronautics and aviation; communications; meteorology; military; medicine, botany, and zoology; commerce; astronomy; Latin expressions, states, punctuation, and proofreading; and technical journals.

"Chemical Inventions and Chemical Patents." Edward Thomas. Published jointly by Matthew Bender & Co., Inc., Albany, N. Y., and Clark Boardman Co., Ltd., 11 Park Pl., New York 7, N. Y. Cloth, 6 by 9 inches, 889 pages. Price, $16.50.

Designed to aid patent attorneys, research chemists, and engineers interested in the patenting of chemical inventions, this book presents a complete exposition of the steps involved in pre-

paring a patent. The volume is written around the conception that pitfalls clearly pointed out are likely to be easily avoided, resulting in stronger patents that can withstand future contests. Court decisions are constantly cited as authority for all statements made, and many of the chapters end with a summary of illustrative decisions.

There are 29 chapters in the book, divided into the following six sections: surveying prospective patent rights in an invention; appraising the patent rights formulating the patent rights; construing formulated patent rights; acquiring formal patent rights; and exploiting acquired patent rights. A general appendix of typical patents is included, together with a table of cases and a comprehensive 71-page index.

NEW PUBLICATIONS

"Emery Solid Fatty Acids." Emery Industries, Inc., Carew Tower, Cincinnati 2, O. 12 pages. This bulletin provides complete information on the specifications, characteristics, processing, and packaging of the company's 13 solid fatty acids. Characteristics discussed include stability, composition quality, and uniformity of the acids, and their effect on finished products.

"Symposium on Effects of Low Temperatures on the Properties of Materials." Special Technical Publication No. 78. American Society for Testing Materials, 1916 Race St., Philadelphia 3, Pa. 68 pages. Price, $1.50. This symposium comprises four papers presented at March 19, 1946, meeting of the Society's Philadelphia District, together with discussions. The papers are: "Low Temperature Behavior of Organic Plastics," H. K. Nason, T. S. Carswell, and C. H. Adams; "Low Temperature Properties of Elastomers," J. W. Liska; "Effects of Subatmospheric Temperatures on the Properties of Non-Ferrous Metals," N. L. Mochel; and "The Properties of Weldmelts at Low Temperatures," R. D. Stout.

"Pliolite S-6B." Techni-Guide #601-B. Goodyear Tire & Rubber Co., Inc., Akron 16, O. 6 pages. This bulletin gives detailed information on the properties, compounding, processing, and applications of Pliolite S-6B. Formulations and physical properties appear for GR-S and GR-S natural rubber shoe sole compounds containing Pliolite S-6B as the reinforcing resin.

"Rubber Developments." Vol. 3, No. 2, June, 1950. British Rubber Development Board, Market Bldgs., Mark Lane, London E.C. 3, England. 36 pages. In addition to stories on new applications of rubber, this issue features a survey of the Board's activities during 1949 in England, the United States, Malaya, and South Africa.

"Labor-Management Cooperation for Safety." Bureau of Labor Standards Bulletin No. 121. President's Conference on Industrial Safety, United States Department of Labor, Washington 25, D. C. 4 pages. This bulletin sets forth the principles approved by the Committee on Labor-Management Cooperation for Safety of the President's Conference, and emphasizes the role of such cooperation in reducing industrial deaths and accidents.

"Solubility of Baker Products." Baker Castor Oil Co., New York, N. Y. 4 pages. This bulletin gives tabulated data on the solubility at room temperature of 33 castor oil products in each of 46 common commercial solvents. The products tested include castor and modified castor oils, dehydrated castor oils, and castor oil esters and acids.

Publications of Standard & Poor's Corp., 345 Hudson St., New York 14, N. Y. **"Tires and Rubber.** Basic Analysis." Section 4, March 23, 1950. 16 pages. This survey presents tabulated and other data on the position of the rubber industry; use of synthetic rubber and reclaimed rubber; inventory valuation; tires, with respect to replacement and original equipment sales, costs and prices, distribution, and use in the farm equipment field; other industrial rubber products; and financial information. **"Tires and Rubber.** Current Analysis." Section 3, March 23, 1950. 4 pages. This report discusses the earnings outlook for 1950 and gives reviews of the financial and stock market activities of 11 tire and tire building machinery manufacturers.

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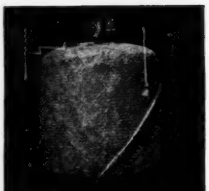

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"Tygon Corrosion Resistant Paint." U. S. Stoneware Co., P. O. Box 350, Akron 9, 12 pages. This illustrated booklet gives information on the properties and applications of the different Tygon paints, lists recommended primers and surface treatments, and includes an extensive table showing the resistance of Tygon to various chemicals.

"A.S.T.M. Standards on Rubber Products (With Related Information)." American Society for Testing Materials, 1916 Race St., Philadelphia 3, Pa. April, 1950. 649 pages. Price $4.75. This compilation gives in latest form all the standard and tentative test methods and specifications on rubber products issued by the Society's Committee D-11. Some 107 standards cover all types of testing and such products as hose and belting, tape, hard rubber, wire and cable, latex products, cements, latices, and others.

"Crotonaldehyde." Tennessee Eastman Corp., Kingsport, Tenn. One page. This technical data sheet covers information on the specifications, properties, applications, shipping containers, and toxicity of crotonaldehyde. Applications include use as a solvent, and as an intermediate in the preparation of synthetic resins, rubber accelerators, dyes and synthetic pyrethrins.

"A.S.T.M. Standards on Electrical Insulating Materials (With Related Information)." American Society for Testing Materials, 1916 Race St., Philadelphia 3, Pa. January, 1950. 674 pages. Price, $4.85. This compilation includes all of the standards, tentative test methods, and specifications on electrical insulating materials and covers both production and use of these materials. Eight specifications on rubber tapes are included, as well as standards on insulating fabrics, plastics, textiles, and other materials.

"Carbon Blacks Formed by Decomposition of Mixtures of Acetylene with a Hydrocarbon or Other Gas at Elevated Pressures." G. W. Jones, R. E. Kennedy, I. Spolan, G. S. Scott, U. S. Bureau of Mines, Report Investigation No. 4695 (1950). United States Bureau of Mines, Pittsburgh, Pa. 9 pages. **"List of Inspected Electrical Equipment, May, 1950."** Underwriters' Laboratories, Inc., Chicago 11, Ill. 496 pages. **"Koppers, The Company—Its Products and Activities."** Koppers Co., Inc., Pittsburgh 19, Pa. 20 pages. **"A M A Annual Report 1949-50."** American Management Association, New York 18, N. Y. 32 pages.

BIBLIOGRAPHY

Vulcanization at High Pressures. C. S. Wilkinson, Jr., S. D. Gehman, *Ind. Eng. Chem.*, Apr., 1949, p. 841.

Technology of New Rubbery Condensation Polymers. D. A. Harper, *Trans. Inst. Rubber Ind.*, Dec., 1948, p. 181.

Energy of Resilience and Abrasion Resistance. F. N. Upham, *Trans. Inst. Rubber Ind.*, Dec., 1948, p. 196.

Rubber Adhesives in Industry. L. E. Puddefoot, *Trans. Inst. Rubber Ind.*, Dec., 1948, p. 199.

Symposium on Plasticizers. *Ind. Eng. Chem.*, Apr., 1949: **Use of Plasticizers.** W. A. Woodcock p. 663. **Plasticizers from Oxo Alcohols.** W. J. Sparks, D. W. Young, p. 665. **Plasticizers for Polar Synthetic Rubbers.** L. E. Cheyney, p. 670. **Plasticizers in Vinyl Chloride-Acetate Resins.** M. C. Reed, J. Harding, p. 675. **Heat Softening of Cellulose Acetate.** G. M. Moelter, E. Schweizer, p. 684. **Polyvinyl Chloride Compounds.** R. R. Lawrence, E. B. McIntyre, p. 689. **Cellulose Acetate Butyrate Plastics.** W. M. Gearhart, W. D. Kennedy, p. 695. **Plasticized Polyvinyl Chloride.** T. Alfrey, Jr., N. Wiederhorn, R. Stein, A. Tobolsky, p. 701.

Thiazole Derivatives as Vulcanization Accelerators. I. T. Kimijima, S. Miyama, *J. Soc. Rubber Ind. (Japan)*, 45, 957. (1942). **II-IV.** *Ibid.*, 46, 264 (1943). **V-VI.** T. Kimijima, S. Miyama, H. Suzuki, *Ibid.*, 562. **VII-VIII.** T. Kimijima, S. Miyama, *Ibid.*, 679. **IX-X.** *Ibid.*, 838.

Studies of Magnesium Carbonate for Transparent Vulcanized Rubber. Y. Tanaka, *J. Soc. Rubber Ind. (Japan)*, 15, 1 (1942).

The Relation between Magnesium Carbonate and the Transparency of Vulcanized Rubber. Y. Tanaka, *J. Soc. Rubber Ind. (Japan)*, 15, 14 (1942).

Causes of the Aging of Vulcanized Rubber. T. Okita, *J. Soc. Rubber Ind. (Japan)*, 15, 96 (1942).

Influence of the Material Forming the Mold Surface on the Tensile and Aging Properties of Rubber Vulcanized in Molds. *J. Rubber Research*, 17, 203 (1948).

Vulcanization-Accelerating Properties of the Cationic Soap, Octadecylbromopyridine. T. Koide, T. Kubota, T. Taketomi, *J. Soc. Rubber Ind. (Japan)*, 15, 118 (1942).

Marking Processes and Media for Plastics. E. E. Halls, *Plastics (London)*, 12, 570 (1948).

Hitakol. Y. Matsuyama, T. Matsushima, *J. Soc. Rubber Ind. (Japan)*, 15, 170 (1942).

Porous Sheet Process of Drying GR-S. W. F. Bixby, *Rubber Age (N. Y.)*, Mar., 1949, p. 701.

Application of Very Fine Furnace Black in Low Temperature GR-S. H. A. Braendle, C. W. Sweitzer, H. C. Steffen, *Rubber Age (N. Y.)*, Mar., 1949, p. 708.

Quality Control of Factory Mixed Batches of Rubber Compounds. P. E. Gnaedinger, *Rubber Age (N. Y.)*, Mar., 1949, p. 711.

Effect of Whole Tire Reclaimed Rubber on the Accelerated Aging of Natural Rubber and GR-S. J. M. Ball, R. L. Randall, *Rubber Age (N. Y.)*, Mar., 1949, p. 718.

Production and Properties of Cement-Latex Materials. V. F. Zhuravlev, B. I. Sheveleva, *Tsement*, 14, 1, 8 (1948).

A Case of Schamberg Dermatosis in a Worker Exposed to Benzene Vapors. A. Capellini, L. Parmeggiani, *Med. lavoro*, 39, 245 (1948).

Processing Characteristics of Neoprene. N. L. Catton, *Rubber Age (N. Y.)*, Apr., 1949, p. 39.

Modern Quality Control Applied to Compounding. A. Oladko, *Rubber Age (N. Y.)*, Apr., 1949, p. 44.

Emulsion Polymerizations at Low Temperatures. C. F. Fryling, S. H. Landes, W. M. St. John, C. A. Uraneck, *Ind. Eng. Chem.*, May, 1949, p. 986.

Emulsion Copolymerization of Methyl Isopropenyl Ketone with Butadiene. C. W. Gould, G. E. Hulse, *Ind. Eng. Chem.*, May, 1949, p. 1021.

Methyl Isopropenyl Ketone-Butadiene Copolymers. C. W. Gould, L. O. Amberg, G. E. Hulse, *Ind. Eng. Chem.*, May, 1949, p. 1025.

Cellulose Acetate Butyrate Strip Coating Compositions. C. J. Malm, H. B. Nelson, G. D. Hiatt, *Ind Eng. Chem.*, May, 1949, p. 1065.

Combating Corrosion with Rubber Lining. R. McFarland, *Corrosion*, 5, 3, 98 (1948).

Proposal of a New Mechanism of Retarding the Aging of Vulcanized Rubber. (By Using Nitro Compounds and Peroxides). **V.** S. Minatoya, K. Sugino, *J. Soc. Rubber Ind. (Japan)*, 15, 873 (1942). **VI.** *Ibid.* 947. **VII.** *Ibid.*, 16, 15 (1943).

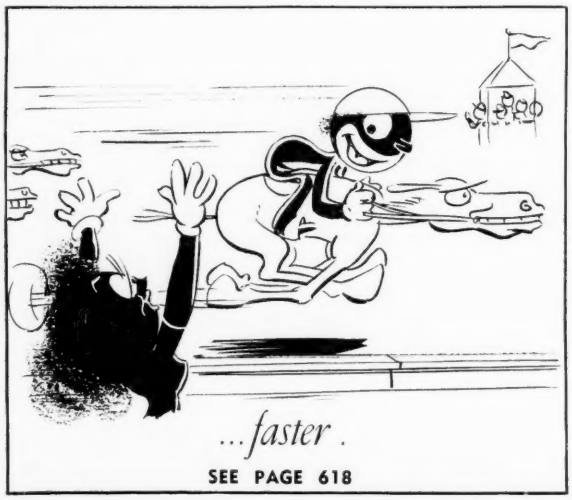
Butadiene from Petroleum. E. Treszczanowicz, *Przemysl Chem.*, 4, 391, (1948).

The Study of Isano Oil and Its Use in Industry. M. Fauve, *Peintures, pigments vernis*, 24, 5, 147 (1948).

Variation of the Specific Heat of Rubber as a Function of Elongation. A. R. Mayor, C. G. Boissonnas, *Helv. Chim. Acta*, 31, 1514 (1948).

Flow Phenomena in Rubber Samples. F. *Rössler, Z. angew. Physik*, 1, 50 (1948).

A Method of Measuring Dynamic Mechanical Properties of Rubber-Like Materials. K. W. Hillier, H. Kolsky, J. P. Lewis, *J. Applied Phys.*, 20, 227 (1948). **Comment.** A. W. Nolle, *Ibid.*, 227.



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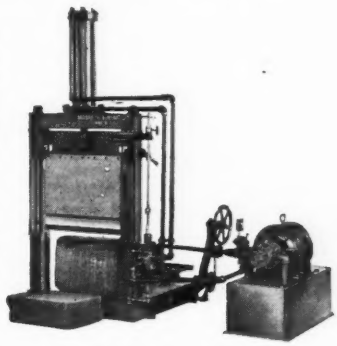

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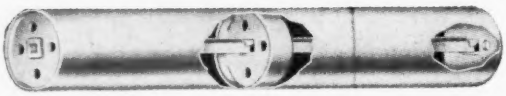

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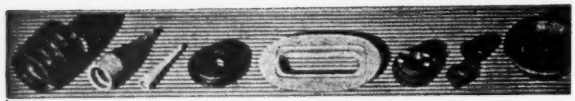

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Determination of Sulfur in Rubber Mixtures. M. Outa, *Anais assoc. quim. Brasil*, 7, 159 (1948).

Chlorinated Paraffin and Rubber. B. Bogo, *Tech. et appl. pétrole, Spec. issue, "Materiel ind. pétrolière,"* 35 (1949).

Synthetic Rubber from Alcohol. S. Kielbasinski, *Przemysl Chem.*, 4, 384 (1948).

Synthetic Rubber from Petroleum Hydrocarbons. H. Burstyn, *Nafta*, 3, 122, 130, 173, (1947).

Butene Dehydrogenation. E. W. Nicholson, J. E. Moise, M. A. Segura, C. E. Kleiber, *Ind. Eng. Chem.*, 41, 646 (1949).

Developments in Styrene Copolymers. F. Armitage, D. H. Hewitt, J. J. Sleightholme, *J. Oil & Colour Chemists' Assoc.*, 31, 437 (1948).

Vinylcyclopropane. J. P. Jones, *Chem. Eng. News*, 27, 454 (1949).

Viscosity-Molecular Weight Relations for Various Synthetic Rubbers. R. L. Scott, W. C. Carter, M. Magat, *J. Am. Chem. Soc.*, 71, 220 (1949).

Manufacture of High-Grade Gasoline and Lubricant Oil by Hydrocracking of Raw Rubber. Y. Tanaka, R. Kobayashi, *J. Soc. Rubber Ind. (Japan)*, 15, 487 (1942).

Acceleration of the Polymerization of Unsaturated Compounds by Means of Oxidation-Reduction Systems. W. Kern, *Kunststoffe*, 39, 45 (1949).

New Technique in Coatings: "Vinylite" Resin Dispersions. G. M. Powell, 3rd, R. W. Quarles, *Official Digest Federation Paint & Varnish Production Clubs*, No. 263, 696 (1946).

Geometric Disorders in Linear Polymers. S. T. Gross, *Phys. Rev.*, 73, 1233 (1948).

Compounding of Natural Rubber with a New Fine Particle Silica. E. M. Allen, F. W. Gage, R. F. Wolf, *Rubber Age (N. Y.)*, June, 1949, p. 297.

How Schacht Rubber Reduced Fuel Operating Costs and Secured Uniform Operating Temperature. A. R. Brandt, *Rubber Age (N. Y.)*, June, 1949, p. 304.

Compression Set of Nitrile Rubbers as Affected by Compounding. C. G. Cashion, *Rubber Age (N. Y.)*, June, 1949, p. 307.

X-Ray Studies of Low-Temperature Polybutadiene and Butadiene-Styrene Copolymers. K. E. Beu, W. B. Reynolds, C. F. Fryling, H. L. McMurry, *Rubber Chem. Tech.*, Apr., 1949, p. 356.

Dynamic Characteristics of Neoprene Vulcanizates. N. L. Catton, E. H. Krismann, W. N. Keen, *Rubber Chem. Tech.*, Apr., 1949, p. 450.

Effect of Light on Neoprene. I. P. A. Sanders, *Rubber Chem. Tech.*, Apr., 1949, p. 465.

A Study of Electrostatic Charges Produced during Mastication of Rubber and of GR-S. R. S. Havenhill, L. E. Carlson, J. J. Rankin, *Rubber Chem. Tech.*, Apr, 1949, p 477; *Ibid*, Oct., p. 1140.

Improved Single-Unit Schiefer Abrasion Testing Machine. H. F. Schiefer, L. E. Crean, J. F. Krasny, *ASTM Bulletin*, July, 1949, p. 73.

Thermosetting Plastic Laminates. II. N. A. Skow. *Product Eng.*, 19, 2, 138 (1949).

Adhesion of Polythene to Metal. C. E. Richards, R. L. Bull, *J. Soc. Chem. Ind. (London)*, 68, 19 1949).

Swelling of Rubber. II. J. Furukawa, T. Iwasaki, *J. Soc. Rubber Ind. (Japan)*, 21, 76 (1948).

Determination of the Heat Resistance of Ebonite. S. M. Fainshtein, *Zavodskaya Lab.*, 13, 746 (1947).

Chemical Aspects of Elastomers. H. W. Melville, *Chemistry & Industry*, 83 (1949).

Treatment of Rayon Cord for Automobile Tires. I-III. T. Koide, T. Kubota, R. Takai, S. Shimamura, M. Kawaguchi, K. Yokoi, J. Kundo, *J. Soc. Rubber Ind. (Japan)*, 21, 68 (1948).

Use of Polymerizable Ring Compounds in Constant-Volume Polymerization. A. V. Tobolsky, F. Leonard, G. P. Roeser, *J. Polymer Sci.*, 3, 604 (1948).

Soft Rubber Bearings. A. Bednar, *Rubber Age (N. Y.)*, May, 1949, p. 173.

Fire Tests on Rubber Tire Storage. N. J. Thompson, *Rubber Age (N. Y.)*, May, 1949, p. 180.

Application of Dispersed Organic Colors in Rubbers, Vinyls and Other Plastics. T. G. Sullivan, H. H. Watjen, *Rubber Age (N. Y.)*, May, 1949, p. 182.

Cooling of Calender and Mill Rolls. J. J. Mayer, *Rubber Age (N. Y.)*, May, 1949, p. 186.

New-Type Curing Bag Connections Reduce Tire Processing Costs. *Rubber Age (N. Y.)*, May, 1949, p. 189.

Investigation on the Nature of Adhesion. *Rubber Age (N. Y.)*, May, 1949, p. 191.

Electric Strength of Paraffins and Some High Polymers. A. E. W. Austen, H. Pelzer, *J. Inst. Elec. Engrs. (London)*, 93, I, 525 (1946).

Mass-Spectrometric Investigation of the Thermal Decomposition of Polymers. L. A. Wall, *J. Research Natl. Bur. Standards*, 41, 315 (1948). RP No. 1928.

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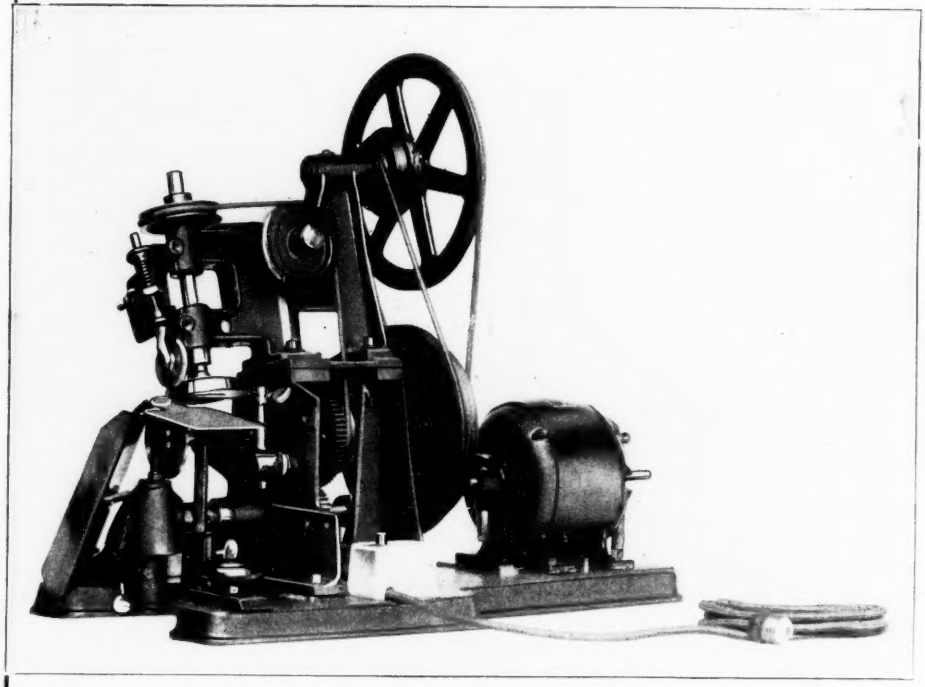

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Market Reviews

CRUDE RUBBER

Commodity Exchange

WEEK-END CLOSING PRICES

Futures	June 24	July 29	Aug. 5	Aug. 12
Oct.	24.59	43.65	51.30	45.30
Dec.	23.75	37.00	46.39	40.39
Feb.	22.92	35.47	42.46	36.76
Apr.	22.17	33.70	39.50	33.72
June	21.45	32.30	38.10	32.10
Aug.	20.65	31.50	37.30	31.30
Total weekly sales, tons	8,930	9,820	4,550	4,160

TRADING in rubber futures on the Commodity Exchange during the first half of August saw the runaway price boom finally halted. The beginning of August saw prices continuing their climb, which reached a peak on August 7, and then they began to fall off rapidly. The advance was based on sharp increases in the foreign markets said to be caused by United States government stockpile purchases. The backbone of the market was broken on August 8, when several groups of short interest were able to cover their commitments.

Several factors combined to check the advance and force prices down, with the chief factor being the report that Rubber Order R-1 was to be revised to decrease crude rubber usage by about 20%. At the same time, fear of price controls and rollbacks to lower levels served to prohibit the building up of long positions and resulted in steadily declining open interest in rubber futures. The announcement that the RFC has been requested to boost production of GR-S to 650,000 tons a year also had a marked bearish effect on the market. Several additional stand-by GR-S plants are expected to be reactivated, but it is considered unlikely that the new high level of production will be achieved until the beginning of next year.

Another factor influencing the price decline was the estimates that Malayan natural rubber production this year will exceed the 685,000-ton figure predicted by the International Rubber Study Group in May, and the prediction that the Indonesian output will total about 650,000 long tons this year.

The high margin requirements placed on rubber futures contracts by the Exchange's board of governors effectively reduced speculative action in the market. These requirements were raised three times in less than one month, with the last change coming on August 7. Under this ruling, margin requirements on regular transactions were raised from $2,500 to $5,000 per contract; on hedge transactions from $1,500 to $2,500 per contract; and on straddle transactions from $750 to $1,200 per contract.

October futures started the month at 46.30¢, rose to a peak of 53.30¢ on August 7 before the market broke, then fell to close at 41.30¢ on August 15. Other futures prices showed similar movement: December rose from 40.39¢ to a high of 48.39¢ on August 7 and then dropped to 37.25¢ on August 15. Sales volume was light as buyers awaited further declines since the only brake on the falling prices during the initial drop was the 200-point permissible daily market variation. Sales for the half month totaled 8,360 tons.

New York Outside Market

WEEK-END CLOSING PRICES

	June 24	July 29	Aug. 5	Aug. 12
No. 1 R.S.S.:				
Spot	27.50	50.00	63.50	46.50
Sept.	25.25	44.50	60.00	43.00
Oct.	24.50	42.50	57.00	41.00
Nov.	24.50	40.50	55.00	39.50
No. 3 R.S.S.	27.25	49.00	62.50	45.25
No. 2 Brown	24.25	42.00	56.50	40.50
Flat Bark	22.50	39.50	52.50	37.50

THE breaking of the rubber market had a drastic effect on spot rubber prices on the New York Outside Market during the first half of August. With no daily variation limit to check the decline, prices dropped as much as 11¢ a pound a day as buyers withdrew completely. Whereas rubber for immediate delivery was almost impossible to obtain during the price boom, the sudden break in the foreign physical markets resulted in a relatively strong flood of spot and nearby rubber being offered in the domestic market. With no takers on hand, prices began to drop as precipitously as they had previously climbed during the boom of the past few months.

Continuing the advance of the preceding month, the spot price for No. 1 sheets started the month at 52.00¢ and rose to a peak of 63.50¢ on August 4 and 7, the highest level since 1917. With the break in the market, the price dropped rapidly and closed at 43.50¢ on August 15. No. 3 sheet prices began the month at 51.00¢, reached a high of 62.50¢ on August 4 and 7, and ended at 42.25¢ on August 15. Prices for No. 2 Brown went from 44.75¢ to a high of 56.50¢, then dropped to 37.50¢; while Flat Bark prices rose from 40.00¢ to a peak of 52.50¢ before declining to close at 34.50¢ on August 15.

Latices

THE *Hevea* latex picture during the first half of August was uncertain owing to the need of stockpiling, high prices, and unsettled supplies, according to Arthur Nolan, writing in the August issue of *Natural Rubber News*. Current stocks are too low, and a figure of 10,000 tons, in addition to afloats, is spoken of as a likely goal to be achieved within six months. This would mean that consumption may have to be reduced by as much as 1,000 tons a month, or 25% of the current rate.

The supply of *Hevea* latex is still insufficient to cover consumption rates, and the announced intention of one major Malayan producer to discontinue shipments to the United States on January 1 and taper off his shipments from September 1 onward may have the effect of counteracting the increased supplies of other producers. Supplies may, therefore, continue only to approximate a balance with expected consumption.

Both the factors of stockpiling and supplies will have an important effect on *Hevea* latex prices, which are, of course, also linked closely to the price of crude rubber with its own market uncertainties. Because of this fact it is impossible to predict the probable course of *Hevea* latex prices with any degree of accuracy. The latex was reported to be quoted at a differential of 7.5-11.5¢ a pound over No. 1 Ribbed Smoked Sheets during the first half of August, although some black market latex transactions were rumored to have been made at the price of $1 a pound.

Hevea latex imports during June are estimated at 3,965 long tons, dry weight; consumption, 4,246 long tons; and month-end stocks, 3,880 long tons. The current high prices for latex have already retarded its use in foam, and further decreases can be expected unless prices decline to more reasonable levels.

GR-S latex production during July was 2,495 long tons, dry weight, and is estimated at 2,500 long tons for August. Imports of GR-S latex are steadily increasing from Canada, and the material is finding ever wider use as a replacement for natural latex.

WITH this issue market reports will end with the fifteenth of the month preceding date of issue instead of the end of that month, as has been the custom in the past. Except for this September issue, a full month's coverage will be given, but the period will run from the fifteenth of one month until the fifteenth of the next.

This change is necessitated by our efforts to mail each issue of India Rubber World nearer to the first of the month of issue than we have been able to in the past. We believe our readers will find this earlier mailing date more advantageous. Editor.

SCRAP RUBBER

BOOM conditions continued in the scrap rubber industry during the first half of August, with prices scoring sharp advances. A great deal of scrap rubber was said to be available through various collectors throughout the country, but sellers were reluctant to make commitments in view of the uncertain price structure. The need of some stabilization of the market in order to assure steady movement of scrap rubber was noted by some traders, and toward the middle of August prices for scrap checked their advance, at least temporarily, and fell off slightly. A major factor in this halting of the price rise was the fear that runaway prices for scrap would hasten goverment controls over the market.

Mixed auto tires increased $6 a ton in the East and $4 a ton at Akron to a new uniform price of $25. No. 1 peelings advanced by $10 a ton at Akron and in the East; while No. 3 peelings rose $5 a ton. Black passenger tubes moved up 2.00¢ a pound, and red tubes went up 3.00¢ a pound to reach new highs.

Following are dealers' selling prices for scrap rubber, in carload lots, delivered to mills at the points indicated:

	Eastern Points	Akron, O.
	(Per Net Ton)	
Mixed auto tires	$25.00	$25.00
Peelings, No. 1	60.00	60.00
3	35.00	35.00
	(¢ per lb.)	
Black inner tubes	8.00	8.00
Red passenger tubes	12.00	12.00

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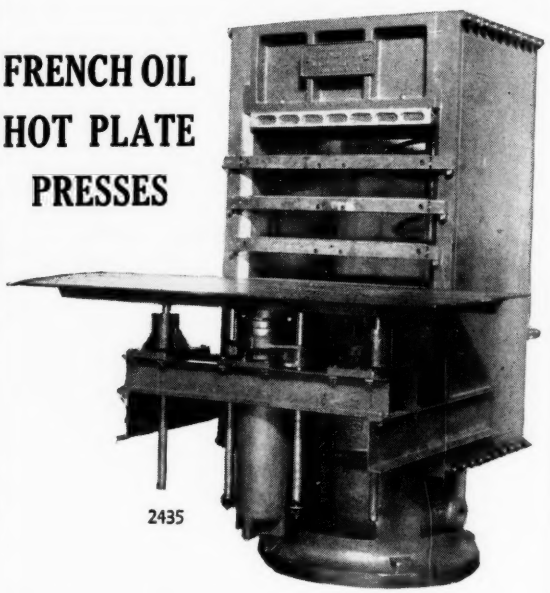

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RECLAIMED RUBBER

OUTPUT of reclaimed rubber during August was reported to be completely sold out for the second successive month. Production continues at top speed, but is harried by the uncertain conditions in the scrap rubber market, where prices and availability are unsettled. Prices of whole tire reclaim rose again by 1¼¢ a pound in the face of advancing scrap prices. Prices of peel and tube reclaims also rose, but do not appear in the table below because of their indefinite nature in view of uncertain scrap availability. Reclaim prices, in general, are almost on a spot basis, with quotations not being made on any grades for other than immediate delivery. Reclaimers state that prices will be reduced as soon as scrap costs permit, and that there is no desire on their part to make more than a normal profit.

Final May and preliminary June statistics on the domestic reclaimed rubber industry are now available. May production totaled 24,876 long tons; imports, three long tons; consumption, 24,158 long tons; exports, 881 long tons; and month-end stocks, 27,837 long tons. Preliminary figures for June show a production of 25,651 long tons; consumption, 25,244 long tons; exports, 900 long tons; and month-end stocks, 27,780 long tons.

Reclaimed Rubber Prices

	Sp. Gr.	¢ per Lb.
Whole tire	1.18-1.20	10.00-10.75
Peel	1.18-1.20	nom.
Inner tube		
Black	1.20-1.22	nom.
Red	1.20-1.22	nom.
GR-S	1.18-1.20	nom.
Butyl	1.16-1.18	nom.

The above list includes those items or classes only that determine the price basis of all derivative reclaim grades. Every manufacturer produces a variety of special reclaims in each general group separately featuring characteristic properties of quality, workability, and gravity at special prices.

COTTON AND FABRICS

NEW YORK COTTON EXCHANGE
WEEK-END CLOSING PRICES

Futures	June 24	July 29	Aug. 5	Aug. 12
Oct.	32.76	38.83	37.05	37.87
Dec.	32.62	38.78	37.09	37.97
Mar.	32.68	38.88	37.14	37.95
May	32.63	38.81	37.03	37.91
July	32.40	38.30	36.68	37.43
Oct.	30.84	35.30	33.96	34.99

COTTON futures prices moved erratically on the New York Cotton Exchange during the period from August 1 to 15. During the first week of the month, prices moved downward as the result of increasing volume of hedge selling against purchases from the CCC 1948-1949 pooled stock of cotton. With the release of the United States Department of Agriculture's surprisingly low cotton crop estimate on August 8, prices rose sharply to new highs. The rise was short-lived, and prices then declined in the face of continued hedging against CCC cotton and against increased movement of new crop cotton in Texas.

The market was surprised at the unexpectedly low 10,308,000-bale cotton crop estimate announced by the government, since private estimates had run at least one million bales higher. As compared with last year's output of 16,127,000 bales, this crop will be about 30% below the current rate of consumption. Reserves from last year's crop, however, are said to be sufficient to meet needs until the next year's crop is harvested. Some observers expressed the belief that the estimate allowed for crop damage that will not occur, and that the next estimate, due September 1, would show a corresponding upward revision.

The spot price for 15/16-inch cotton started at 39.10¢ on August 1, fell to a low of 38.17¢ on August 4, rose with the crop estimate to a high of 39.35¢ on August 9, and closed at 38.30¢ on August 15. October futures showed corresponding movement, starting the month at 38.00¢, falling to a low of 37.05¢ on August 4, reaching a high of 38.28¢ on August 9, and closing at 37.31¢ on August 15.

Fabrics

Most industrial fabric mills making sateens, twills, chafers, and other goods report that they are almost completely sold up for the balance of the year and will not take orders beyond that point. What business was still being done during the first half of August was at prices pegged to the fluctuations of the cotton markets, and all prices listed in the table below must be, therefore, considered nominal.

In view of the heaviest demand for goods in recent years, many mills not yet on a six-day work week are considering taking this step, while others are weighing the initiation of a third shift in their plants. Much of the additional pinch on supply comes from military needs, but the industrial call for such goods as chafers, headlinings, and coating fabrics has been very high for several months.

Cotton Fabrics

Drills		
59-inch 1.85-yd.	*yd.*	$0.41
2.25-yd.		.355
Ducks		
38-inch 1.84-yd. S. F.	*yd.*	nom.
2.00-yd. D. F.	*yd.*	nom.
51.5-inch, 1.35-yd. S. F.		nom.
Hose and belting		.68
Osnaburgs		
40-inch 2.11-yd.	*yd.*	.265
3.65-yd.	*yd.*	.1675
Raincoat Fabrics		
Bombazine, 64x60 5.35-yd.	*yd.*	nom.
Print cloth, 38½ inch, 64x60		.195
Sheeting, 48-inch, 4.17-yd.		.22⅜
52-inch 3.85-yd.		.245
Chafer Fabrics		
14-oz./sq. yd. Pl.	*lb.*	.725 .75
11.65-oz/sq. yd. S.		.67 .685
10-80-oz./sq. yd. S.		.71 .725
8.9-oz./sq. yd. S.		.725 .735
Other Fabrics		
Headlining, 59-inch 1.35-yd 2-ply,	*yd.*	.62
64-inch 1.25-yd. 2-ply		.65
Sateens, 53-inch 1.32-yd.		.635
58-inch 1.21-yd.		.695
Tire Cords		
K. P. std., 12-3-3	*lb.*	.785
12-4-2		.775

RAYON

TOTAL domestic shipments of rayon by producers during July amounted to 103,600,000 pounds, an increase of 1% over the June figure. Shipments for the first seven months of this year totaled 704,500,000 pounds, a new all-time high, exceeding by 11% the previous record set in 1948. Shipments of rayon filament yarn during July were 78,400,000 pounds, an increase of 400,000 pounds over those of the preceding month. Of these July yarn shipments, 24,800,000 pounds were high-tenacity viscose yarn, 27,600,000 pounds were viscose and supra textile yarn, and 26,000,00 pounds were acetate yarn. Total shipments of high-tenacity yarn during the first seven months of 1950 show increases of 4% and 19%, respectively, over the corresponding 1949 and 1948 figures.

Prices of rayon tire yarns and fabrics rose by 2-3¢ a pound late in July, and current prices follow:

Rayon Prices

Tire Yarns	
1100/480	$0.58
1100/490	.57
1150/490	.57
1650/720	.56/.57
1650/980	.56
1900/980	.56
2200/960	.56
2200/980	.55
4400/2934	.58
Tire Fabrics	
1100/490/2	.66
1650/980/2	.635/.67
2200/980/2	.625

Financial

(*Continued from page* 704)

Pittsburgh Coke & Chemical Co., Pittsburgh, Pa., and subsidiaries. Six months to June 30: net profit, $1,333,452, equal to $2.27 a common share, contrasted with $1,041,555, or $1.75 a share, in last year's half; gross sales, $16,193,507, against $10,436,472.

Pittsburgh Plate Glass Co., Pittsburgh, Pa. Half ended June 30: net income, $19,358,325, equal to $2.14 a share, contrasted with $15,570,288, or $1.72 a share, in the '49 half; sales, $151,956,693, against $140,352,496.

St. Joseph Lead Co., New York, N. Y., and domestic subsidiaries. Initial half, 1950: net income, $4,121,164, equal to $2.08 each on 1,975,456 capital shares, contrasted with $4,852,390, or $2.45 a share, a year earlier; net sales, $44,848,764, against $43,546,168.

Thermoid Co., Trenton, N. J. and subsidiaries. Half ended June 30: net income, $704,296, equal to 85¢ a common share, against $419,578, or 47¢ a share, in the same period last year; sales, $12,303,386, against $11,219,468.

Union Carbide & Carbon Corp., New York, N. Y., and subsidiaries. First half, 1950: consolidated net income, $60,805,199, equal to $2.11 each on 28,806,344 capital shares, compared with $42,126,139, or $1.46 each on 28,807,314 shares, in the 1949 half; sales, $330,840,573, against $288,748,244.

United Carbon Co., Charleston, W. Va., and subsidiaries. June half, 1950: net profit, $1,639,766, equal to $2.06 a share, against $1,353,303, or $1.70 a share, in the like period last year.

United Engineering & Foundry Co., Pittsburgh, Pa., and subsidiaries. Six months ended June 30: net income, $3,422,625, equal to $4.14 each on 820,746 common shares, contrasted with $2,565,507, or $3.09 a share, in the first half last year; net sales, $36,489,448, against $32,124,567.

The Institution of the Rubber Industry

LONDON

THE RUBBER INDUSTRY owes its development largely to scientific and technical research and the Institution was founded in 1921 to foster scientific and technical advancement and to disseminate the results.

THE INSTITUTION TODAY is the centre of a great fraternity of rubber manufacturers, scientists, technologists, research establishments, executives and students from every country whose object is the advancement of the cause of the rubber industry throughout the world.

OBJECTS: To promote corporate and concerted effort in the industry by bringing together all those engaged or interested in the various branches of science and technology on which the Industry is based and co-ordinating their respective contributions.

To promote the profession and practice of Rubber Technology.

To encourage the extension of scientific and technical education in the principles and details of rubber manufacture.

To maintain a scheme of Diplomas for the recognition of efficiency in knowledge of all branches of technology essential to the successful maintenance and development of rubber manufacture.

To arrange for the holding of meetings, the reading of papers and the giving of lectures with subsequent discussions and publication.

To foster the systematic study of scientific and technical problems involved in the various phases of the manufacture of natural and synthetic rubbers and rubber-like materials and their conversion into finished products.

To encourage original work and research dealing with the manufacture of rubbers.

PUBLICATIONS.

The Transactions: Bi-monthly record of scientific and technological investigations in the realm of rubber and its allied industries.

Annual Report on the Progress of Rubber Technology: containing systematic accounts of the developments in rubber technology from year to year.

Proceedings of Rubber Technology Conferences.

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At this time of progress and expansion in the affairs of the Institution, its Council, conscious of the benefits that lie within the sphere of the Institution, invites applications for the privilege of membership from those engaged or interested in the Rubber and its allied industries.

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Ducks

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Ducks

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320 BROADWAY
NEW YORK

COMPOUNDING INGREDIENTS

Current Quotations*

Abrasives

Pumicestone, powdered	lb.	$0.025	/ $0.055
Rottenstone, domestic	ton	36.00	/ 43.00

Accelerators, Organic

A-10	lb.	.40	/ .47
A-19	lb.	.52	/ .58
A-32	lb.	.59	/ .69
A-77	lb.	.42	/ .55
A-100	lb.	.42	/ .55
Accelerator 8	lb.	83	
49	lb.	.44	/ .45
89	lb.	1.20	
122	lb.	1.30	
552	lb.	1.80	
808	lb.	.59	/ .61
833	lb.	1.13	/ 1.15
Aero AC 50	lb.	.56	/ .56
165	lb.	.37	/ .39
Altax	lb.	.38	/ .40
Rodform	lb.	.385	/ .405
Arazate	lb.	2.16	
Beutene	lb.	.59	/ .64
B-J-F	lb.	.27	/ .32
Butasan	lb.	1.00	
Butazate	lb.	1.00	
Butyl Eight	lb.	1.00	/ 1.05
Zimate	lb.	1.00	
Captax	lb.	.30	/ .32
C-P-B	lb.	1.95	
Cumate	lb.	1.45	
Cuprax	lb.	.60	/ .62
Diesterex N	lb.	.50	/ .57
DOTG (diorthotolyguanidine)	lb.	.44	/ .50
DPG (diphenylguanidine)	lb.	.39	/ .45
El-Sixty	lb.	.41	/ .48
Ethasan	lb.	1.00	
Ethazate	lb.	1.00	
Ethyl Thiurad	lb.	1.00	
Tuads	lb.	1.00	
Tuex	lb.	1.00	
Zimate	lb.	1.00	
Ethylac	lb.	.88	/ .90
Good-rite Erie	lb.	.32	/ .34
Hepteen	lb.	.42	/ .48
Base	lb.	1.80	/ 1.90
Ledate	lb.	1.00	
M-B-T	lb.	.30	/ .35
M-B-T-S	lb.	.38	/ .43
Mertax	lb.	.40	/ .47
Methesan	lb.	1.00	
Methazate	lb.	1.00	
Methyl Selenac	lb.	1.60	
Tuads	lb.	1.10	
Zimate	lb.	1.00	
Monex	lb.	1.10	
Mono-Thiurad	lb.	1.10	
Morfex	lb.	.56	/ .61
O-X-A-F	lb.	.39	/ .44
Pentex	lb.	1.00	
Flour	lb.	.20	
Phenex	lb.	.40	/ .45
Pipazate	lb.	1.53	
Rodform products	lb.	1.00	/ 3.00
Rotax	lb.	.42	/ .44
S. A. 52	lb.	1.10	
57, 62, 67, 77	lb.	1.00	
66	lb.	1.45	
Safex	lb.	1.15	
Santocure	lb.	.58	/ .65
Selazate	lb.	1.45	
Selenac	lb.	1.45	
SPDX-GH	lb.	.64	/ .69
Tellurac	lb.	1.45	
Tepidone	lb.	.55	
Tetrone	lb.	1.25	
A	lb.	1.85	
Thalam	lb.	.75	
Thiofide	lb.	.38	/ .45
Thionex	lb.	1.10	
Thiotax	lb.	.30	/ .37
Thiurad	lb.	1.10	
Thiuram E	lb.	1.00	
M	lb.	1.10	
Trimene	lb.	.54	/ .64
Base	lb.	1.03	/ 1.18
Tuex	lb.	1.10	
2-MT	lb.	.53	/ .55
Ultex	lb.	1.00	/ 1.10
Ureka Base	lb.	.58	/ .65
C	lb.	.63	/ .70
Vulcanex	lb.	.45	
Z-B-X	lb.	2.45	
Zenite	lb.	33	/ .35
A	lb.	.42	/ .44
B	lb.	.39	/ .41
Special	lb.	.34	/ .36
Zetax	lb.	.38	/ .41

Accelerator-Activators, Inorganic

Lime hydrated	ton	8.50	/ 14.00
Litharge, comml.	lb.	.1575	/ .1685
Eagle, sublimed	lb.	.1675	/ .1685
National Lead	lb.	.1675	/ .1685
Red lead, comml.	lb.	.1675	/ .1775
Eagle, National Lead	lb.	.1775	
White lead, basic	lb.	.1625	/ .1675
Eagle, National Lead	lb.	.1625	/ .1675
White lead, silicate	lb.	.1475	/ .1925
Eagle	lb.	.175	/ .1925
National Lead	lb.	.1475	/ .1575
Zinc oxide, comml.†	lb.	.14	/ .18

Accelerator-Activators, Organic

Aktone A, B	lb.	$0.20	/ $0.21
Barak	lb.	.60	
Curade	lb.	.57	/ .59
D-B-A	lb.	1.95	
Delac P	lb.	.45	/ .52
Emersol 110	lb.	.155	/ .1675
120	lb.	.165	/ .1775
130	lb.	.1875	/ .20
210 Elaine	lb.	.16	/ .1875
Emery 600		.13	/ .1575
Hyfac 430	lb.	.175	/ .1875
431	lb.	.185	/ .1975
Laurex	lb.	.24	/ .27
Lead oleate	lb.	.24	
MODX	lb.	.295	/ .345
NA-11	lb.	.65	
Palmalene	lb.	.35	
Plastone	lb.	.27	/ .30
Polyac	lb.	1.40	
Seedine	lb.	.1485	/ .1705
SOAC-KL	lb.	.08	/ .11
Stearex Beads	lb.	.147½	/ .157½
Stearic acid, single pressed	lb.	.155	/ .1675
Double pressed	lb.	.165	/ .1775
Triple pressed	lb.	.1875	/ .20
Stearite	lb.	.095	/ .10
Tonox	lb.	.50	/ .59
Zinc stearate	lb.	.34	/ .36

Alkalies

Caustic soda, flake	100 lbs.	3.45	/ 6.67
Liquid, 50%	100 lbs.	2.40	/ 2.50
Solid	100 lbs.	3.20	/ 6.42

Antioxidants

AgeRite Gel	lb.	.60	/ .62
H.P.	lb.	.67	/ .69
Hipar	lb.	.91	/ .93
Powder	lb.	.49	/ .51
Resin	lb.	.65	/ .67
D	lb.	.49	/ .51
Stalite	lb.	.49	/ .51
White	lb.	1.40	/ 1.50
D	lb.	1.45	/ 1.55
Akroflex C	lb.	.61	/ .63
Albasan	lb.	.69	/ .73
Aminox	lb.	.46	/ .55
Antioxidant 2246	lb.	1.60	/ 1.70
Antisol	lb.	.23	/ .24
Antox	lb.	.46	/ .48
Aranox	lb.	3.25	
Betanox Special	lb.	.68	/ .77
B-L-E	lb.	.46	/ .55
25	lb.	.46	/ .55
B-X-A	lb.	.43	/ .52
Copper Inhibiter X-872-L	lb.	1.75	
Deenex	lb.	.95	/ 1.05
Flectol H	lb.	.49	/ .56
Flexamine	lb.	.61	/ .70
Heliozone	lb.	.25	/ .26
Ionol	lb.	.95	/ 1.40
NBC	lb.	1.50	
Neozone (standard)	lb.	.66	/ .68
A	lb.	.48	/ .50
C	lb.	.52	/ .54
D	lb.	.46	/ .48
DL	lb.	.48	/ .50
Parazone	lb.	.75	
Perflectol	lb.	.61	/ .68
Permalux	lb.	1.65	
Rio Resin	lb.	.52	/ .54
Santoflex 35	lb.	.67	/ .74
AW	lb.	.66	/ .73
B	lb.	.49	/ .56
BX	lb.	.60	/ .67
Santovar A	lb.	1.30	/ 1.37
O	lb.	1.10	/ 1.17
Santowhite Crystals	lb.	1.55	/ 1.62
L	lb.	.49	/ .56
MK	lb.	1.25	/ 1.32
S.C.R.	lb.	.32	/ .34
Sharples Wax	lb.	.23	/ .28
Stabilite	lb.	.46	/ .48
Alba	lb.	.69	/ .74
L	lb.	.48	/ .50
Sunolite	lb.	.20	
Sunproof	lb.	.25	/ .30
Improved	lb.	.23	/ .28
Jr	lb.	.18	/ .23
Thermoflex A	lb.	.82	/ .84
Tonox	lb.	.50	/ .59
Tysonite	lb.	.215	/ .2225
V-G-B	lb.	.65	/ .74
Wing-Stay S	lb.	.48	/ .58
Zenite	lb.	.33	/ .35

Antiseptics

Copper naphthenate, 6-8%	lb.	.2275	
G-4	lb.	1.15	/ 2.70
G-11	lb.	3.50	
Pentachlorophenol	lb.	.20	/ .28
Resorcinol, technical	lb.	.71	/ .75
Zinc naphthenate, 8-10%	lb.	.2025	/ .26

Blowing Agents

Ammonium, bicarbonate	lb.	.055	/ .06
Carbonate	lb.	.20	/ .21
Sodium bicarbonate	100 lbs.	1.10	/ 5.02
Carbonate, technical	100 lbs.	1.00	/ 5.02
Unicel	lb.	.60	
ND	lb.	1.50	
S	lb.	.25	

Bonding Agents

MDI	lb.	$7.00	/ $7.75
50	lb.	3.50	/ 4.00
Ty-Ply Q, S	gal.	6.75	/ 8.00

Brake Lining Saturants

B.R.T. No. 3	lb.	.024	/ .025
Resinex L-S	lb.	.0225	/ .03

Carbon Blacks

Conductive Channel—CC

Continental R-20, -40	lb.	.15	/ .22
Kosmos/Dixie BB	lb.	.18	/ .215
Spheron C	lb.	.12	/ .165
N	lb.	.22	/ .25
Voltex	lb.	.18	/ .315

Easy Processing Channel—EPC

Continental AA	lb.	.069	/ .1175
Kosmobile 77/Dixiedensed 77	lb.	.069	/ .1125
Micronex W-6	lb.	.065	/ .1175
Spheron #9	lb.	.069	/ .117
Texas E	lb.	.065	/ .1075
Witco #12	lb.	.069	/ .1175
Wyex	lb.	.069	/ .115

Hard Processing Channel—HPC

Continental F	lb.	.069	/ .1175
HX	lb.	.069	/ .115
Kosmobile S/Dixiedensed S	lb.	.069	/ .1175
Micronex Mk. II	lb.	.065	/ .1125
Spheron #4	lb.	.069	/ .117
Witco #6	lb.	.069	/ .1175

Medium Processing Channel—MPC

Arrow TX	lb.	.069	/ .115
Continental A	lb.	.069	/ .1175
Kosmobile S-66/Dixiedensed S-66	lb.	.069	/ .1175
Micronex Standard	lb.	.065	/ .1125
Spheron #6	lb.	.069	/ .117
Texas M	lb.	.065	/ .1075
Witco #1	lb.	.069	/ .1175

Conductive Furnace—CF

Statex A	lb.	.08	/ .10

Fast Extruding Furnace—FEF

Statex M	lb.	.0525	/ .095

Fine Furnace—FF

Statex B	lb.	.055	/ .0975
Sterling 99	lb.	.065	/ .105
105	lb.	.12	/ .16

High Abrasion Furnace—HAF

Aromex	lb.	.074	/ .1125
Philblack O	lb.	.075	/ .119
Statex R	lb.	.074	/ .12
Vulcan #1, #3	lb.	.074	/ .117

Medium Abrasion Furnace—MAF

Philblack A	lb.	.0575	/ .10

High Modulus Furnace—HMF

Continex HMF	lb.	.05	/ .09
Kosmos 40/Dixie 40	lb.	.05	/ .09
50/Dixie 50	lb.	.055	/ .095
Modulex	lb.	.05	/ .075
Statex 93	lb.	.0475	/ .09
Sterling L	lb.	.05	/ .09
SO	lb	.055	/ .095

Reinforcing Furnace—RF

Kosmos 60/Dixie 60	lb.	.074	/ .1125

Semi-Reinforcing Furnace—SRF

Continex SRF	lb.	.035	/ .075
Essex	lb.	.035	/ .055
Furnex	lb.	.0325	/ .075
Non-staining	lb.	.035	/ .0775
Gastex	lb.	.035	/ .075
Kosmos 20/Dixie 20	lb.	.035	/ .075
Pelletex	lb.	.035	/ .075
Sterling NS, R, S	lb.	.035	/ .075

Very Fine Furnace—VFF

Statex K	lb.	.07	/ .12

Fine Thermal—FT

P-33	lb.	.05	

Medium Thermal—MT

Thermax	lb.	.0325	
Stainless	lb.	.04	

Chemical Stabilizers

Dutch Boy Plumb-O-Sil A	lb.	.28	
B	lb.	.295	
DS-207	lb.	.5025	
Dyphos	lb.	.57	
Dythal	lb.	.375	
Normasal	lb.	.4175	
Tribase	lb.	.2425	
E	lb.	.2075	
Staflex OY	lb.	1.75	
QMXA	lb.	.60	
Vanstay 16, 25	lb.	.33	/ .35
H	lb.	.75	/ .77
Witco Lead Stearate #50	lb.	.5025	
Stabilizer #70	lb.	1.25	

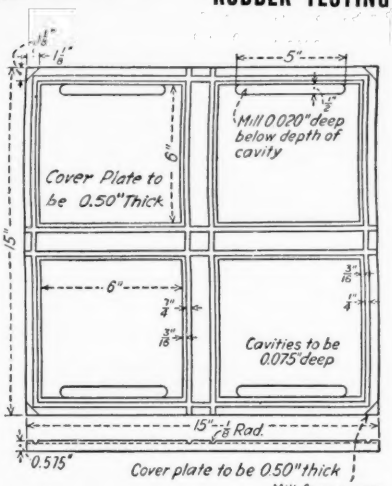
*Prices in general are f.o.b. works. Range indicates grade or quantity variations. Space limitation prevents listing of all known ingredients. Prices are not guaranteed; contact suppliers for spot prices.

†For trade names, see Color—White, Zinc Oxide.

HOGGSON BRAND
Since 1849

MOLDS & DIES
FOR
RUBBER TESTING

ONE OF THE MANY MOLDS AVAILABLE



Molds from 7" to 24" sq. for tension samples, and molds for compression samples if desired. Molds in dimensions varying from 1" x 1" x ¼" up for abrasion test samples. Molds and dies for slab curing. Please describe your need.

HOGGSON & PETTIS MFG. CO.
141S Brewery St., New Haven 7, Conn.
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ORIGINAL PRODUCERS OF MAGNESIUM SALTS FROM SEA WATER

Magnesium salts from the sea

REGULAR AND SPECIAL GRADES OF
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TO SERVE OUR OLD AND NEW FRIENDS IN THEIR REQUIREMENTS

ESTABLISHED 1903

BAIRD RUBBER
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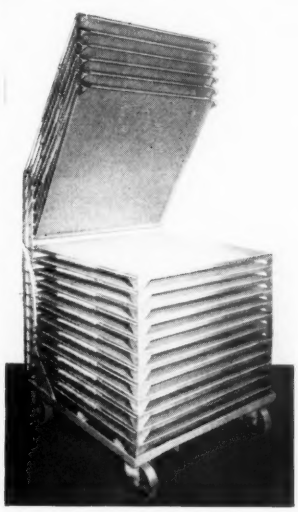
233 Broadway, New York, N. Y.
WOrth 4-1460

New Stock Cooling Rack



This new Rack gives unobstructed access to three sides of each tray and offers a convenient method for storing materials that require cooling or air drying. The one piece construction Trays are spring supported and can be quickly raised or lowered, free from all locking devices. Racks having 18 perforated trays 36" x 36" or plain surface trays 36" deep by 4 ft., 6 ft. and 8 ft. long, can be furnished either stationary or mounted on casters.

SPADONE MACHINE COMPANY, INC.
10 East 43rd St. New York 17, N. Y.

Colors

Black

Black Paste #25	lb.	$0.22	/ $0.40
BK Iron Oxides	lb.	.11	/ .1125
Lampblack, commil.	lb.	.07	/ .30
Superjet	lb.	.075	/ .11
Mapico	lb.	.1075	/ .11
MB Mineral Blacks	lb.	.0315	/ .0675

Blue

Du Pont	lb.	1.54	/ 3.95
Heveatex pastes	lb.	.80	/ 1.45
Stan-tone	lb.	1.00	/ 1.35
Toners	lb.	.30	/ 3.50

Brown

Brown Paste #5, #10	lb.	.35	/ .45
Mapico	lb.	.1225	/ .125
Tan	lb.	.1925	/ .195
Metallic brown	lb.	.0315	/ .044
Plastics brown	lb.	.0625	/ .07
Sienna, burnt	lb.	.0425	/ .155
Raw	lb.	.045	/ .1325
Umber, burnt	lb.	.0525	/ .075
Raw	lb.	.0425	/ .065

Green

Chrome	lb.	.125	/ .4275
Oxide	lb.	.33	/ 1.00
Du Pont	lb.	1.50	/ 3.20
G-4099, -6099	lb.	.34	/ .345
G-7599	lb.	.405	/ .41
GH-9869	lb.	.85	/ 1.00
9976	lb.	.95	/ 1.10
Heveatex pastes	lb.	.95	/ 1.85
Stan-Tone	lb.	1.50	/ 3.30
Toners	lb.	.35	/ 4.00

Orange

Du Pont	lb.	2.75	
Orange Paste #13	lb.	1.35	/ 1.50
Stan-Tone	lb.	1.65	/ 2.25
Toners	lb.	.30	/ 1.50

Red

Antimony trisulfide	lb.	.55	/ .68
R. M. P. Sulfur Free	lb.	.63	/ .68
R. M. P. No. 3	lb.	.55	/ .60
Cadmium red lithopone	lb.	1.25	/ 1.65
Cadmolith Red	lb.	.92	/ 1.00
Du Pont	lb.	1.15	/ 1.65
Indian Red	lb.	.1175	/ .12
Iron oxide, red	lb.	.0175	/ .0975
Light	lb.	.1175	/ .12
Mapico	lb.	.115	/ .1175
Red Paste #17, I-2	lb.	.95	/ 1.10
Rub-Er-Red	lb.	.0975	
Stan-Tone	lb.	1.10	/ 3.05
Toners	lb.	.25	/ 4.15

White

Antimony oxide	lb.	.2175	/ .2275
Burgess Iceberg	ton	50.00	
Lithopone, titanated	lb.	.085	/ .095
Cryptone BT	lb.	.085	/ .095
Titanium pigments:			
Rayox LW	lb.	.195	/ .205
R-110	lb.	.215	/ .225
Ti-Cal	lb.	.075	/ .0825
Ti-Pure	lb.	.195	/ .225
Titanox A-168,-LO,-MO	lb.	.195	/ .205
RA, RA-10	lb.	.215	/ .225
RCHT	lb.	.075	/ .08
Zopaque	lb.	.195	/ .205
Zinc oxide, commil	lb.	.14	/ .18
Azo ZZZ-11, -44, -55	lb.	.1475	/ .1575
-66	lb.	.17	/ .18
35% leaded	lb.	.1475	/ .1575
Eagle AAA, lead free	lb.	.1475	/ .1575
5% leaded	lb.	.1475	/ .1525
35% leaded	lb.	.1425	/ .1575
50% leaded	lb.	.1475	/ .1575
Florence Green Seal-8	lb.	.165	/ .175
Red Seal-9	lb.	.16	/ .17
White Seal-7	lb.	.17	/ .18
Horsehead XX-4, -78	lb.	.1475	/ .1575
Kadox-15, 17, -72	lb.	.1475	/ .1575
-25	lb.	.17	/ .18
Lehigh, 35% leaded	lb.	.1425	/ .1525
50% leaded	lb.	.14	/ .15
Protox-166	lb.	.1475	/ .1575
St. Joe, lead free	lb.	.1475	/ .1575
Standard, 5% leaded	lb.	.1475	/ .1575
Zinc sulfide, commil	lb.	.20	/ .21
Cryptone ZS	lb.	.20	/ .21

Yellow

Cadmium yellow lithopone	lb.	1.02	
Cadmolith Yellow	lb.	.92	/ .100
Chrome	lb.	.25	
Du Pont	lb.	1.35	/ 1.85
Iron oxide, yellow	lb.	.0141	/ .0925
Mapico	lb.	.09	/ .0925
Stan-Tone	lb.	1.00	/ 1.55
Toners	lb.	.50	/ 1.37
Yellow D	lb.	1.25	/ 1.35

Dispersing Agents

Darvan Nos 1, 2	lb.	.21	/ .30
Stan-Chem	lb.	.1225	/ .2587
Triton R-100	lb.	.12	/ .25

Dusting Agents

Extrud-o-Lube, conc.	gal.	1.57	
Glycerized Liquid Lubricant, concentrated	gal.	1.25	
Lubrex	lb.	.25	/ .30
Mica	lb.	$0.07	/ $0.0775
Pyrax A	ton	12 50	
W. A.	ton	15.00	
Snow Crest Talc	ton	33.00	/ 35.00
Vanfre	gal.	2.00	/ 2.50

Extenders

B. R. S 700	lb.	.0175	/ .026
B. R. T. No. 7	lb.	.0265	/ .0275
Dielex B	lb.	.06	
Factice, Amberex	lb.	.30	/ .38
Brown	lb.	.12	/ .33
Neophax	lb.	.18	/ 1.35
Ozonite	lb.	.2365	
White	lb.	.13	/ .32
G. B. Asphaltenes	lb.	.06	/ .065
Mineral Rubbers			
Black Diamond	ton	38.00	/ 40.00
Extender 600	lb.	.18	
Hard Hydrocarbon	ton	38.00	/ 40.00
No. 38	ton	38.00	/ 40.00
Parmr	ton	21.00	/ 29.00
Nuba No. 1, 2	lb.	.04	/
No. 3X	lb.	.065	
Rubber substitute, brown	lb.	.18	/ .317
White	lb.	.16	/ .33
Synthetic 100	lb.	.41	
Vistanex	lb.	.32	

Fillers, Inert

Barytes, floated, white	ton	35.05	/ 49.65
Off-color, domestic	ton	19.00	/ 20.00
No. 1	ton	37.60	/ 52.40
2	ton	35.60	/ 50.40
Blanc fixe	ton	85.00	/ 118.00
Clays:			
Albacar	ton	40.00	/ 50.00
Aluminum Flake	ton	16.00	/ 22.00
#5	ton	21.00	
Champion	ton	14.00	
Crown	ton	14.00	/ 33.00
Hi-White R	ton	15.00	/ 33.00
Hydratex R	ton	30.00	
Paragon	ton	13.50	/ 31.50
McNamee	ton	13.50	
Stan-Tex White	ton	25.00	
Stellar-R	ton	50.00	
Suprex	ton	14.00	/ 33.00
W-1291 English	ton	53.00	/ 55.00
Witco #1	ton	14.00	/ 30.00
#2	ton	13.50	/ 30.00
Cryptone BA, CB, MS	lb.	.08	/ .0825
Flocks:			
Cotton, dark	lb.	.095	/ .112
Dyed	lb.	.45	/ .85
White	lb.	.12	/ .20
Fabrifil X-24-G	lb.	.095	
X-24-W	lb.	.135	
Filfloc 6000	lb.	.16	
F-40-900	lb.	.105	
Solka-Floc	lb.	.05	/ .15
Kalite	ton	40.00	
Lithopone, commil	lb.	.065	/ .075
Albalith	lb.	.065	/ .075
Astrolith	lb.	.06⅜	/ .0675
Eagle	lb.	.0725	/ .075
Sunolith	lb.	.06⅜	/ .0675
Mica	lb.	.07	/ .0775
No. 1 Silica	ton	22.00	/ 40.00
Purecal D	ton	45.00	/ 52.50
M	ton	40.00	/ 52.50
Pyrax A	ton	12.50	
W. A.	ton	15.00	
SL Slate Flour	ton	17.00	/ 25.00
Suspenso	ton	22.00	
Swansdown	ton	20.00	
Terra Alba 1319	ton	27.00	
Ti-Cal	lb.	.0675	
Whiting, limestone	ton	6.00	/ 15.00
Paxinosa	ton	9 00	/ 17.00
Witco	ton	8.50	

Finishes

Black-Out	gal.	4.50	/ 8.00
Flexible Rubber Paints	gal.	4.00	/ 9.00
Flocks			
Cotton, dark	lb.	.095	/ .112
Dyed	lb.	.45	/ .85
White	lb.	.12	/ .20
Rayon, colored	lb.	.90	/ 1.50
White	lb.	.75	/ 1.25
Rubber lacquer, clear	gal.	1.00	/ 2.00
Colored	gal.	2.00	/ 3.50
Shoe varnish	gal.	1.45	
Talc	ton	14.00	/ 35.00
Wax, Bees	lb.	.50	/ .70
Carnauba	lb.	.90	/ 1.18
Montan	lb.	.155	/ .32
No. 118, colors	gal.	.86	/ 1.41
Neutral	gal.	.76	/ 1.31
Van Wax	gal.	1.25	/ 1.30

Latex Compounding Ingredients

Accelerator 89	lb.	1.20	
122	lb.	1.30	
552	lb.	1.80	
Acrysol GS, 15% solids	lb.	.13	/ .185
Aerosol	lb.	.35	
AgeRite Dispersions	lb.	.60	/ 2.25
Amberex Solutions	lb.	.1675	/ .18
Aquablaks	lb.	.0725	/ .17
Aquarex BBX, Conc	lb.	.78	
D	lb.	.76	
MDL Paste	lb.	.30	
ME	lb.	.92	
NS	lb.	.60	
SMO	lb.	.50	
WA Paste	lb.	.25	
Areskap 50	lb.	$0.30	/ $0.38
100, dry	lb.	.60	/ .72
Aresket 240	lb.	.30	/ .38
300, dry	lb.	.60	/ .72
Aresklene 375	lb.	.42	/ .57
400, dry	lb.	.70	/ .84
Black No. 25, dispersed	lb.	.22	
Casein	lb.	.29	/ .37
CW-12	lb.	.85	
CW-37	lb.	.70	
DC Antifoam A	lb.	5.65	/ 6.65
Dispersed Sulfur No. 2	lb.	.10	/ .12
Ethyl Thiurad	lb.	1.00	
Factice dispersions	lb.	.23	/ .44
Laton L	lb.	.075	/ .0775
Ludox	lb.	.1675	/ .1925
Marmix	lb.	.36	/ .43
Methocel	lb.	.62	/ .80
Micronex, colloidal	lb.	.06	/ .07
Pip-Pip	lb.	1.80	
Pliolite Latex 150, 190	lb.	.32	/ .41
170	lb.	.37	/ .46
Polyca 117-SS	lb.	.18	/ .265
296	lb.	.13	/ .185
350	lb.	.25	/ .37
R-2 Crystals	lb.	1.75	
Resin Emulsion #226	gal.	1.05	
#2246	gal.	1.30	
#2402, #2343	gal.	1.60	
A-155	lb.	.13	/ .18
P-370	lb.	.125	/ .175
Resin V	lb.	.13	
Santomerse D	lb.	.43	/ .65
S	lb.	.12	/ .25
Setsit No. 5	lb.	1.00	
SPDX-GL	lb.	.95	
Stablex A	lb.	.90	/ 1.10
B	lb.	.50	/ .95
G	lb.	.50	/ .70
L	lb.	.30	/ .40
Sulfur Dispersion, 50%	lb.	.07	/ .15
66%	lb.	.09	/ .17
73%	lb.	.10	/ .12
Tamol N	lb.	.1525	/ .26
Tergitol wetting agents	lb.	.265	/ .37
Thiocarbanilide (A-1)	lb.	.40	/ .47
Zinc oxide, dispersed	lb.	.13	/ .20

Mold Lubricants

Aquarex D	lb.	.76	
L Paste	lb.	.85	
MDL Paste	lb.	.30	
WA Paste	lb.	.25	
Carbowax compounds	lb.	.29	/ .295
Colite Concentrate	gal.	.90	/ 1.15
ELA	lb.	.80	
DC Mold Release Fluid Emulsion Nos. 35, 35A, 35B	lb.	4.14	/ 6.00
DC 7	lb.	1.68	/ 3.50
Glycerized Liquid Lubricant, concentrated	gal.	6.20	/ 6.80
Lubrex	lb.	1.25	/ .30
Mold Paste	lb.	.25	
Monten Wax	lb.	.57	
Para Lube	lb.	.046	/ .048
Polyethylene Glycols	lb.	.23	
Sodium stearate	lb.	.51	/ .53
Stearite	lb.	.095	/ 10
Vanfre	gal.	2.00	/ 2.50

Odorants

Alamasks	lb.	.60	/ 6.50
B-3223	lb.	2.50	
Curodex 19	lb.	4.75	
188	lb.	5.75	
198	lb.	6.75	
GD-4440	lb.	3.50	
-5280, -5424, -53481	lb.	2 50	
-5296	lb.	1.25	
-5386	lb.	2.00	
Paradors	lb.	.43	/ 3.25
Resodor Nos. 1, 5	lb.	2.50	
No. 10	lb.	.40	
Rodo No. 0	lb.	4.00	/ 4.50
No. 10	lb.	5.00	/ 5.50

Plasticizers and Softeners

Akroflex C	lb.	.61	/ .63
Aro Lene #1980	lb.	.10	/ .12
Bardol	lb.	.0225	/ .0325
B	lb.	.055	/ .0575
639	lb.	.0225	/ .04
Bondogen	lb.	.55	/ .60
BRC 20	lb.	.0125	/ .0135
30	lb.	.011	/ .0195
521	lb.	.0175	/ .0185
B. R. H. No. 2	lb.	.02	/ .029
B. R. S. 700	lb.	.02	/ .026
R. R. T. No. 4	lb.	.0225	/ .0235
B. R. V.	lb.	.0325	/ .049
Bunarax resins	lb.	.05	/ .11
Bunnatol G. S.	lb.	.40	/ .505
Butac	lb.	.105	/ .115
BxDC	lb.	.40	/ .41
Carbonex	lb.	.0325	/ .0375
664	lb.	.0375	/ .0425
645	lb.	.036	/ .0385
S	lb.	.04	/ .045
S Plastic	lb.	.0385	/ .0435
Contogums	lb.	.0875	/ .111
Cumar EX	lb.	.0525	
MH	lb.	.065	/ .11
V	lb.	.0975	/ .1275
Dielex B	lb.	.06	
Dipolymer Oil	gal.	.33	/ .38
Dispersing Oil No. 10	lb.	.0525	/ .055
Duraplex C-50 LV, 100%	lb.	.25	/ .295
Dutrex 6	lb.	.025	/ .035

CLASSIFIED ADVERTISEMENTS

ALL CLASSIFIED ADVERTISING MUST BE PAID IN ADVANCE

Effective July 1, 1947

GENERAL RATES	SITUATIONS WANTED RATES	SITUATIONS OPEN RATES
Light face type $1.25 per line (ten words)	Light face type 40c per line (ten words)	Light face type $1.00 per line (ten words)
Bold face type $1.60 per line (eight words)	Bold face type 55c per line (eight words)	Bold face type $1.40 per line (eight words)

Allow nine words for keyed address.

Letter replies forwarded without charge, but no packages or samples.

Address All Replies to New York Office at 386 Fourth Avenue, New York 16, N. Y.

SITUATIONS WANTED

CHEMIST-SUPERINTENDENT WITH 22 YEARS' EXPERIENCE in the laboratories and on compound development along with general factory engineering and management. Products: tires, tubes, leather-like shoe soles, floor tile, printers' rolls, and various other mechanicals. Address Box No. 613, care of INDIA RUBBER WORLD.

RUBBER PRODUCT ENGINEER, M.E. GRADUATE, 10 YEARS' varied supervision experience with major firms on design, installation, laboratory liaison, development testing, mechanical and proofed goods, adhesives, films, and oil-resistant specialties for automotive, aviation, and railroad fields. Address Box No. 614, care of INDIA RUBBER WORLD.

MANAGER—EXPERIENCED IN ALL PHASES OF MECHANICAL goods—compounding, technical, costing, development and production—desires connection with aggressive company desiring to add new lines. Address Box No. 615, care of INDIA RUBBER WORLD.

ASSISTANT SUPERINTENDENT, TIRE AND METHODS ENGINEER with 17 years' experience in rubber footwear and clothing, desires new position. Address Box No. 616, care of INDIA RUBBER WORLD.

RUBBER TECHNOLOGIST—CHEMIST: B.S. IN CHEMISTRY. Experienced in compound formulation and development (crude and all types of synthetic rubber), technical service to mechanical goods, wheels, V-belts, flat belts, and rubber covered rolls. Presently chief chemist in molded goods plant, thoroughly familiar with factory operations, handling inquiries, and organizing lab work. Excellent references. (Specialty—compounds for low-temperature use). Address Box No. 617, care of INDIA RUBBER WORLD.

TECHNICAL EXECUTIVE WITH 20 YEARS' EXPERIENCE IN rubber and plastic, desires position with medium-size or small company in capacity of factory manager, laboratory director, technical superintendent. Fully qualified in compounding research, development, and manufacturing. Familiar with factory processing and machinery. Address Box No. 618, care of INDIA RUBBER WORLD.

LATEX CHEMIST: M.S. FIFTEEN YEARS' EXPERIENCE compounding all latices and rubber dispersions. Considerable sales service work. Foamed latex experience. Desires position in production, development, or sales service with progressive company in eastern area. Capable initiating, supervising, and completing program. Executive ability. Address Box No. 620, care of INDIA RUBBER WORLD.

SITUATIONS WANTED (Continued)

RUBBER COMPOUNDER AND SUPERVISOR WITH 25 YEARS experience compounding and processing plastic and rubber insulated wire. Interested in a small- or medium-sized plant, supervisory or quality control. Address Box No. 621, care of INDIA RUBBER WORLD.

CHEMIST VERY WELL GROUNDED IN PRESSURE-SENSITIVE tapes on paper, on fabric, on foils. Able to produce on spreaders. Laminating cements. Lacquer-coated goods for shoe trade. Ability proven. Address Box No. 622, care of INDIA RUBBER WORLD.

CHIEF CHEMIST OR ASSISTANT: YOUNG, AGGRESSIVE COLlege graudate with proven ability in the rubber industry. Thoroughly familiar with all types of compounding, factory operations, specification specialties and production methods. Desires position as chemist with part-time sales work and technical service. Good opportunity for a progressive company to fill two positions with one man. Presently chief chemist small mechanical goods plant. (Well qualified for low-temperature compounds). Excellent references. Address Box No. 623, care of INDIA RUBBER WORLD.

SITUATION OPEN

SPONGE RUBBER CHEMIST—EXCELLENT OPPORTUNITY FOR capable man in sound, well-financed company. Specify all qualifications and details first letter. Address Box No. 619, care of INDIA RUBBER WORLD.

MACHINERY AND SUPPLIES WANTED

WILL TRADE 26" FOUR-ROLL CALENDER FOR 50" OR 60" rubber mill. RUBBA, INC., 1015 East 173rd Street, New York 60, N. Y.

WANTED

Financially responsible organization will purchase complete sponge and mechanical rubber goods plant with presses, calenders, mills and extruders. Will consider all offers. Please give complete details first letter.
Address Box 555,
c/o INDIA RUBBER WORLD

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A Chronological Record of the Important Events in the History of Rubber
— 50c per Copy —
INDIA RUBBER WORLD
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WANTED
Chemicals — Colors — Pigments
Resins — Solvents — Glues — Plasticizers
Other Raw Materials
CHEMICAL SERVICE CORPORATION
80 Beaver Street, New York 5 Hanover 2-6970

CUSTOM MIXING
We do milling and compounding of all types — blacks or colors — Master Batches —
All mixing done under careful supervision and laboratory control.
PEQUANOC RUBBER CO.
Phone: Butler 9-0400 BUTLER, NEW JERSEY

WANTED — Large engineering firm wishes to acquire several complete Rubber Plants through purchase of (1) capital stock, (2) assets, (3) machinery and equipment, whole or in part. Personnel retained where possible, strictest confidence. Box 1220, 1474 Broadway, New York 18, N. Y.

BROCKTON TOOL COMPANY
Central Street **QUALITY MOULDS FOR ALL PURPOSES** South Easton, Mass.
THE FIRST STEP—A QUALITY MOULD

(Classified Advertisements Continued on Page 737)

Flexol Plasticizer 3GH	lb.	$0.42	$0.44
3GO	lb.	.515 /	.535
4GO	lb.	.36 /	.38
8N8	lb.	.375 /	.395
DOP	lb.	.43 /	.455
R-1	lb.	.47 /	.475
TOF	lb.	.47 /	.49
TWS	lb.	.405 /	.425
Galex W-100	lb.	.135 /	.1725
W-100D	lb.	.1325 /	.17
Harflex 500	lb.	.34 /	.365
Heavy Resin Oil	lb.	.0225 /	.0375
Hercolyn	lb.	.1112 /	.1347
Indonex	gal.	.11 /	.17
JMH	lb.	.65 /	.68
Monoplex DBS	lb.	.57 /	.58
DOA	lb.	.435 /	.445
DOS	lb.	.60 /	.61
5	lb.	.70 /	.71
Morflex 100	lb.	.36 /	.385
Nevillac oils	lb.	.33	
Resins	lb.	.31 /	.45
Neville LX-685	lb.	.12	
R Resins	lb.	.105 /	.155
Nevinol	lb.	.17	
Nevoll	lb.	.0325 /	.0425
No. 1-D heavy oil	lb.	.055	
Palmalene	lb.	.15	
Panaflex BN-1	lb.	.18 /	.2325
Para Flux, regular	gal.	.10 /	.2025
No. 2016	gal.	.165 /	.24
Heavy	gal.	.155	
Para Lube	lb.	.046 /	.048
Para Resins	lb.	.04 /	.045
Paradene Resins	lb.	.065 /	.075
Paraplex AL-111	lb.	.28 /	.2875
G-25	lb.	.73 /	.74
-40	lb.	.44 /	.45
-50	lb.	.385 /	.395
-60	lb.	.415 /	.425
Peptizene #2	lb.	.90	
Pepton 22	lb.	.72 /	.75
Picco-10, -25	lb.	.12 /	.17
-75, -100	lb.	.115 /	.165
480 Oilproof resin	lb.	.135 /	.185
S. O. S.	gal.	.29 /	.34
Piccocizer 30	lb.	.055 /	.06
Piccolastic Resins	lb.	.24 /	.29
Piccolyte Resins	lb.	.155 /	.215
Piccoumaron Resins	lb.	.055 /	.195
Piccovars	lb.	.12 /	.125
Piccovol	lb.	.025 /	.04
Pictar	gal.	.25 /	.30
Pigmentar	gal.	.037½ /	.0511
Pigmentaroil	gal.	.037½ /	.0511
Plastender S	lb.	.0375 /	.04
Plasticizer 35	lb.	.205 /	.24
36	lb.	.305 /	.34
42	lb.	.34 /	.40
2175	lb.	.46 /	.56
3425	lb.	.605	
3497	lb.	.61	
3560	lb.	.56	
B	lb.	.35 /	.45
SC	lb.	.50 /	.57
Plastogen	lb.	.0775 /	.08
Plastone	lb.	.22 /	.30
PS-60 Resin	lb.	.35	
PT67 Light Pine Oil	gal.	.50 /	.60
101 Pine Tar Oil	lb.	.035 /	.045
400 Light Pine Tar	lb.	.035 /	.045
600 Med. Pine Tar	lb.	.035 /	.045
R-19, R-21 Resins	lb.	.1075	
Reogen	lb.	.1175 /	.12
Resin C pitch	lb.	.025 /	.0335
R6-3	lb.	.38 /	.40
Resinex	lb.	.0325 /	.0375
L-4	lb.	.0225 /	.03
Rosin Oil, Sunny South	gal.	.50 /	.66
RPA No. 2	lb.	.65	
No. 3	lb.	.46	
5	lb.	.57	
RSN Flux	gal.	.10 /	.19
Rubberol	lb.	.215	
S-Polymers	lb.	.44	
Santicizer B-16	lb.	.52 /	.57
E-15	lb.	.49 /	.54
M-17	lb.	.46 /	.51
No. 140	lb.	.3225 /	.38
Seedine	lb.	.1485 /	.1705
Softener #20	gal.	.10 /	.20
Solvenol	gal.	.56 /	.58
Staflex IXA	lb.	.36 /	.37
Staybelite Resin	lb.	.06 /	.065
Stearex Beads	lb.	.147½ /	.157½
Stearite	lb.	.095 /	.10
Syn-Tac	gal.	.33 /	.35
Synthol	lb.	.205	
TR-11	lb.	.035	
Turgum S	lb.	.0975 /	.0975
Tysonite	lb.	.215 /	.2225
X-1 Resinous Oil	lb.	.0175 /	.0325
XX-100 Resin	lb.	.0525	

Reclaiming Oils

Bardol 639	lb.	.0225 /	.04
B. R. H. No. 2	lb.	.02 /	.029
B. R. T. No. 4	lb.	.0225 /	.0235
B. R. V.	lb.	.0325 /	.049
BWH-1	lb.	.14	
Dipolymer Oil	gal.	.33 /	.38
Dispersing Oil No. 10	lb.	.0525 /	.055
Heavy Resin Oil	lb.	.0225 /	.0375
LX-77	gal.	.18 /	.30
-572	gal.	.23 /	.34
No. 1621	lb.	.025 /	.035
3186	gal.	.28 /	.295
Picco C-10	gal.	$0.25 /	$0.30
C-28	gal.	.33 /	.38
C-33	gal.	.20 /	.25
C-42	gal.	.27 /	.32
D-4	gal.	.23 /	.28
E-5	gal.	.21 /	.26
Q-Oil	gal.	.246 /	.296
PT 101 Pine Tar Oil	lb.	.035 /	.045
150 Pine Solvent	gal.	.44 /	.55
Solvenol	gal.	.56 /	.58
S. R. O.	lb.	.015 /	.0225
Wilcor Nos. 111, 151	gal.	.26 /	.30
X-1 Resinous Oil	lb.	.0175 /	.0325
-60 Solvent	gal.	.24 /	.38

Reinforcers, Other Than Carbon Black

Amorez 11-190	lb.	.04 /	.055
BRC 20	lb.	.0125 /	.0135
30	lb.	.011 /	.0195
Bunarex resins	lb.	.05 /	.11
Calcene T	ton	50.00 /	60.00
Calco S. A.	lb.	.75	
Carbonex	lb.	.0325 /	.0375
644	lb.	.0375 /	.0425
645	lb.	.036 /	.0385
S	lb.	.04 /	.045
S Plastic	lb.	.0385 /	.0435
Clays			
Aluminum Flake	ton	16.00 /	22.00
No. 5	ton	20.00	
Buca	ton	40.00	
Burgess Iceberg	ton	50.00	
Pigment No. 20	ton	35.00	
No. 30	ton	37.00	
Polyclay	ton	45.00	
Catalpo	ton	30.00	
Crown	ton	14.00 /	33.00
Dixie	ton	14.00	
Hydratex R	ton	30.00	
L. G. B.	ton	17.00	
Paragon (R)	ton	13.50 /	31.50
Pigment No. 33	ton	30.00	
Suprex	ton	14.00 /	32.00
Witco No. 1	ton	14.00 /	30.00
No. 2	ton	13.50 /	30.00
Clearcarb	lb.	.1175 /	.1225
Cumar EX	lb.	.0525	
MH	lb.	.065 /	.1175
V	lb.	.0975 /	.1275
G Resin	lb.	.08	
Good-Rite Resin 50	lb.	.36 /	.38
Hi-Sil	lb.	.11 /	.12
Magnesia, Calcined, Carey	lb.	.28	
K&M	lb.	.31	
Light, No. 101	lb.	.175	
Rubber grade	lb.	.29 /	.31
Marbon resins	lb.	.38 /	.45
Millical	ton	27.50	
Multiflex MM	ton	105.00	
Special	ton	125.00	
Neville R Resins	lb.	.10 /	.155
Panarez resins	lb.	.04 /	.13
Para Resins 2457, 2718	lb.	.04 /	.045
Picco-75, -100	lb.	.115 /	.165
Piccolastic Resins	lb.	.24 /	.29
Piccolyte Resins	lb.	.155 /	.215
Piccoumaron Resins	lb.	.055 /	.195
Piccovars	lb.	.12 /	.125
Pliolite, S-3, -6, -6B	lb.	.38 /	.45
NR Milled Resin # 50	lb.	.84 /	.91
S-6 Masterbatches	lb.	.36 /	.58
PS 60 Resin	lb.	.35	
Purecal U	ton	105.00 /	125.00
Resin C Pitch	lb.	.025 /	.0335
Resinex	lb.	.0325 /	.0375
Rubber Resin LM-4	lb.	.28 /	.35
S-Polymers	lb.	.44	
Silene EF	ton	110.00 /	120.00
L	ton	115.00 /	125.00
Witcarb R	ton	105.00 /	120.00
R-12	ton	45.00 /	66.00
Zinc oxide, commercial	lb.	.14 /	.18

Retarders

Cumar RH	lb.	.105	
Delac J	lb.	.55 /	.60
E-S-E-N	lb.	.36	
Good-Rite Vultrol	lb.	.55 /	.57
R-17 Resin	lb.	.1075	
Retarder ASA	lb.	.45	
PD	lb.	.34 /	.36
W	lb.	.43	
Retardex	lb.	.51 /	.54
RM	lb.	1.25	
Thionex	lb.	1.25	
Vultrol	lb.	.50 /	.55

Solvents

Bondogen	lb.	.55 /	.60
Cosol	gal.	.30 /	.38
Dichloro Pentanes	lb.	.04 /	.055
Dipentene DD	gal.	.38 /	.39
GVL	lb.	1.00	
Nevsol	gal.	.185 /	.25
Panasol High-Solvency Naphtha	gal.	.19 /	.28
Picco Hi-Solv Solvents	gal.	.15 /	.27
Pine Oil D.D.	gal.	.72	
PT 150 Pine Solvent	gal.	.44 /	.55
Skellysolve-E	gal.	.153	
-H	gal.	.133	
-R, -V	gal.	.109	
-S	gal.	.099	
Tollac	gal.	.195 /	.25
2-50-W Hi-Flash Solvent	gal.	.37	

Synthetic Resins

Geon Latices (dry wt.)	lb.	$0.465 /	$0.60
Paste Resins	lb.	.34 /	.60
Plastics	lb.	.365 /	.85
Polyblend	lb.	.43 /	.58
Polyvinol resins	lb.	.34 /	.58
Marvinol VR-10	lb.	.33 /	.59

Synthetic Rubbers and Latices

Chemigum 30 N-4, 50 N-4	lb.	.45 /	.52
N-1	lb.	.58 /	.65
N-3	lb.	.52 /	.59
Chemigum Latex (dry wt.)			
101A, E	lb.	.32 /	.41
200	lb.	.45 /	.54
235A, B	lb.	.47 /	.57
245 A, B	lb.	.40 /	.50
Hycar OR-15, -15EP	lb.	.52 /	.53
OR-25, -25 EP	lb.	.45 /	.46
OR-25 NS	lb.	.47 /	.48
OS-10	lb.	.50 /	.51
Hycar Latex (dry wt.)			
1501, 1531, 1551	lb.	.49 /	.54
1502, 1552, 1562	lb.	.42 /	.47
1532	lb.	.435 /	.485
Neoprene Latex (dry wt.)			
Type 571, 842 842-A	lb.	.29 /	.40
572, 700	lb.	.30 /	.41
601, 601-A	lb.	.32 /	.43
735	lb.	.36 /	.47
Neoprene Type AC, CG	lb.	.50 /	.53
E	lb.	.65 /	.68
FR, KNR	lb.	.75 /	.78
GN, GN-A, S	lb.	.32 /	.35
RT, W	lb.	.35 /	.38
Paracril 18-80	lb.	.43 /	.45
26NS60, 26NS90	lb.	.44 /	.46
35NS90	lb.	.51 /	.53
Paracril Latex Type H (55%)	lb.	.38 /	.42
Paraplex X-100	lb.	1.00	
Silastic	lb.	2.35 /	4.05

Tackifiers

Bunarex resins	lb.	.05 /	.105
Contogums	lb.	.0875 /	.11
Galex W-100	lb.	.135 /	.1725
W-100D	lb.	.1325 /	.17
Hercolyn	lb.	.1122	.1347
Indopol H-100	gal.	.85 /	1.00
H-300	gal.	1.12 /	1.27
Natac	lb.	.10 /	.11
Nevindene	lb.	.125 /	.155
Picco-10, -25	lb.	.12 /	.17
Piccolastic Tackifiers	lb.	.24 /	.29
Piccolyte Resins	lb.	.155 /	.215
Piccoumaron resins	lb.	.055 /	.195
Staybelite Resin	lb.	.06 /	.065
Synthetic 100	lb.	.41	
Synthol	lb.	.205	
Vistanex	lb.	.32	

Vulcanizing Agents

Dibenzo G-M-F	lb.	2.50	
Ethyl Tuads	lb.	1.00	
G-M-F	lb.	2.50	
Litharge, commercial	lb.	.1575 /	.1685
Eagle, sublimed	lb.	.1675 /	.1685
National Lead	lb.	.1675 /	.1685
Magnesia, calcined	lb.	.29 /	.31
Carey	lb.	.28	
K&M Neoprene Grade	lb.	.31	
Light No. 101	lb.	.175	
Methyl Selenac	lb.	1.60	
Tuads	lb.	1.10	
Red Lead, commercial	lb.	.1675 /	.1775
Eagle, National Lead	lb.	.1775	
Sulfur flour, comml.	100 lbs.	1.60 /	2.30
Black Bird	lb.	.036 /	.041
Calco	lb.	.0175 /	.051
Crystex	lb.	.195	
Insoluble 60	lb.	.13 /	.135
Rubbermakers	100 lbs.	1.75 /	2.45
Spider Brand	lb.	.023 /	.044
Stauffer	lb.	.0175 /	.0285
Telloy	lb.	2.00	
Vandex	lb.	2.00	
Vultac Nos. 1, 2	lb.	.38 /	.45
No. 3	lb.	.42 /	.49
White lead silicate	lb.	.1475 /	.1925
Eagle	lb.	.175 /	.1925
National Lead	lb.	.1475 /	.1575

A Liquid Dispersion Based on Geon Latex, made by B. F. Goodrich Chemical Co., 324 Rose Bldg., Cleveland 15, O., is used as the flameproofing compound in a new line of protective clothing made by Treesdale Laboratories, Inc., Pittsburgh, Pa. The flameproofing compound, called Permaproof 300, differs from many conventional agents in that it contains no pigment. Treesdale has announced that Permaproof 300 will be manufactured on a commercial scale for application to all types of cloth.

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FOR SALE: USED TAYLOR, STILES & COMPANY'S "GIANT" rubber chopper. Write RANKIN MACHINERY CO., INC., 1741 Columbus Ave., Sandusky, Ohio. Phone: 481.

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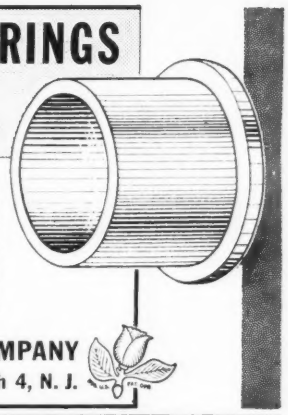

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UNITED RUBBER MACHINERY EXCHANGE

NEW ADDRESS: 183-189 ORATON ST. CABLE "URME" NEWARK 4, N. J.

United States Imports, Exports, and Reexports of Crude and Manufactured Rubber

	May, 1950 Quantity	May, 1950 Value
Exports of Domestic Merchandise		
UNMANUFACTURED, Lbs.		
Crude rubber	8,231	$4,230
Balata	769	2,112
Chicle and chewing gum bases	233,330	80,031
Synthetic rubbers: GR-S	169,751	39,380
Neoprene	829,396	291,858
Nitrile	376,338	171,089
"Thiokol"	6,840	4,075
Polyisobutylene	59,073	19,525
Other, except Butyl	5,607	4,218
Reclaimed rubber	1,974,189	181,626
Scrap rubber	2,192,985	51,197
TOTALS	5,856,509	$849,341
MANUFACTURED		
Rubber cement *gals.*	71,678	$129,908
Rubberized fabric: auto cloth *sq. yds.*	3,547	4,252
Piece goods and hospital sheeting *sq. yds.*	83,346	50,959
Rubber footwear:		
Boots *prs.*	2,609	13,478
Shoes *prs.*	4,292	5,907
Rubber-soled canvas shoes *prs.*	14,002	28,205
Soles *doz. prs.*	15,280	35,899
Heels *doz. prs.*	45,950	40,946
Soling and toplift sheets *lbs.*	232,840	46,151
Gloves and mittens *doz. prs.*	12,691	39,386
Drug sundries: hot water bottles and fountain syringes *no.*	27,262	18,921
Other	.....	181,757
Rubber and rubberized clothing	.....	219,515
Toy and novelty balloons	.....	19,379
Rubber toys and balls	.....	26,572
Erasers *lbs.*	19,475	11,612
Hard rubber goods: battery boxes *no.*	13,293	23,966
Other electrical goods *lbs.*	73,350	64,975
Combs, finished *doz.*	5,044	8,163
Other	.....	12,496
Tires and casings: truck and bus *no.*	49,230	1,803,339
Auto *no.*	44,479	502,421
Aircraft *no.*	.....	28,989
Farm tractor, etc. *no.*	6,616	200,590
Other off-the-road *no.*	3,739	322,360
Bicycle *no.*	7,211	8,565
Motorcycle *no.*	246	1,601
Other *no.*	2,451	72,198
Inner tubes: auto, truck, bus *no.*	47,856	132,912
Other *no.*	8,108	31,122
Solid tires: truck and industrial *no.*	2,846	60,830
Tire repair materials: camelback *lbs.*	188,368	51,582
Other *lbs.*	166,502	145,494
Rubber and friction tape *lbs.*	40,790	25,424
Belting: auto and home *lbs.*	82,728	105,122
Transmission:		
V-belts *lbs.*	100,417	176,751
Flat belts *lbs.*	39,404	38,559
Other *lbs.*	9,636	12,520
Conveyer and levitator *lbs.*	57,377	39,375
Other *lbs.*	6,847	7,486
Hose and tubing *lbs.*	353,243	267,651
Rubber packing *lbs.*	122,484	126,678
Mats, flooring, tiling *lbs.*	577,351	134,355
Thread: bare *lbs.*	7,746	14,347
Textile covered *lbs.*	9,940	28,712
Gutta percha manufactures *lbs.*	1,430	2,283
Latex and other compounded rubber for further manufacture *lbs.*	570,622	164,408
Other natural and synthetic rubber manufactures	.....	384,492
TOTALS	.....	$5,872,613
GRAND TOTALS, EXPORTS	.....	$6,721,954
Reexports of Foreign Merchandise		
UNMANUFACTURED, Lbs.		
Crude rubber	1,327,971	$289,551
Balata	2,592	907
Butyl synthetic rubber	3,023	597
Chicle and chewing gum bases	1,800	1,729
TOTALS	1,335,386	$292,774
MANUFACTURED		
Rubber toys and balls, except balloons	.....	$840
Hard rubber goods	.....	115
Other natural and synthetic rubber products	.....	434
TOTALS	.....	$1,389
GRAND TOTALS, REEXPORTS	.....	$294,163

	May, 1950 Quantity	May, 1950 Value
Imports for Consumption of Crude and Manufactured Rubber		
UNMANUFACTURED, Lbs.		
Crude rubber	127,240,410	$21,822,118
Rubber latex	7,129,423	1,904,513
Chicle, crude	141,923	74,080
Guayule	448,000	58,948
Balata	175,698	50,093
Jelutong or Pontianak	255,496	103,796
Gutta percha	154,308	86,151
Synthetic rubber	6,186,812	1,046,015
Reclaimed rubber	7,000	1,969
Scrap rubber	3,495,646	84,678
TOTALS	145,234,716	$25,232,361
MANUFACTURED		
Tires: auto, bus, truck *no.*	1,443	$22,234
Bicycle *no.*	212	329
Other *no.*	356	218
Inner tubes: auto, etc. *no.*	101	240
Rubber footwear:		
Boots *prs.*	1,956	7,006
Shoes and overshoes *prs.*	2,880	1,124
Rubber-soled canvas shoes *prs.*	1,444	1,291
Athletic balls: golf *no.*	77,040	18,206
Tennis *no.*	113,308	18,722
Other *no.*	447,228	25,745
Rubber toys, except balloons	.....	53,235
Hard rubber products	.....	30,085
Rubberized printing blankets *lbs.*	325	726
Rubber and cotton packing *lbs.*	2,554	1,870
Gaskets and valve packing	.....	115
Belting *lbs.*	4,707	4,969
Hose and tubing	.....	1,975
Drug sundries	.....	5,295
Rubber instruments *doz.*	789	1,413
Other rubber products	.....	153
Rubber bands *lbs.*	4,687	1,405
Gutta percha manufactures *lbs.*	1,390	1,028
Synthetic rubber products	.....	336
Other soft rubber goods	.....	127,388
TOTALS	.....	$325,108
GRAND TOTALS, ALL RUBBER IMPORTS	.....	$25,557,469

SOURCE: Bureau of Census, United States Department of Commerce, Washington, D. C.

United States Rubber Statistics—May, 1950

(All Figures in Long Tons, Dry Weight)

	New Supply: Production	New Supply: Imports	New Supply: Totals	Distribution: Consumption	Distribution: Exports	Month-End Stocks
Natural rubber, total	0	57,004	57,004	59,373	597	96,645
Latex, total	0	*3,695	3,695	4,440	0	4,131
Rubber and latex, total	0	60,699	60,699	63,813	597	100,776
Synthetic rubbers, total	†31,164	2,762	40,082	46,398	620	74,524
GR-S types	‡6,156 †26,549 ‡154	1,952	28,655	35,573	76	54,164
Butyl	‡4,615	810	5,425	5,817	§6	11,426
Neoprene	‡4,386	0	4,386	3,551	370	5,383
Nitrile types	‡1,616	0	1,616	1,457	168	3,551
Natural rubber and latex, and synthetic rubber, total	37,320	63,461	100,781	110,211	1,217	175,300
Reclaimed rubber, total	24,876	3	24,879	24,158	881	27,837
GRAND TOTALS	62,196	63,464	125,660	134,369	2,098	203,137

*Includes adjustment of +512 tons applicable to February.
†Government plant production.
‡Private plant production.
§Includes adjustment of +5 tons applicable to May.

Estimated Automotive Pneumatic Casings and Tube Shipments, Production, Inventory—June-May, 1950; First Half, 1950-1949

Passenger Casings	June, 1950	% of Change from Preceding Month	May, 1950	First Six Months, 1950	First Six Months, 1949
Shipments					
Original equipment	3,605,339		2,732,699	17,109,164	13,338,280
Replacement	5,150,504		4,497,711	20,992,942	17,688,855
Export	48,248		46,450	276,523	236,129
TOTAL	8,804,091	+20.99	7,276,860	38,378,629	31,263,264
Production	7,310,890	— 0.79	7,369,190	38,637,693	33,111,610
Inventory end of month	8,987,234	—13.29	10,364,646	8,987,234	10,618,506
Truck and Bus Casings					
Shipments					
Original equipment	450,413		386,427	2,210,775	2,035,118
Replacement	881,626		798,268	4,204,156	3,215,042
Export	66,081		59,586	378,333	508,849
TOTAL	1,398,120	+12.36	1,244,281	6,793,264	5,759,009
Production	1,169,376	— 7.19	1,259,897	6,887,456	6,345,371
Inventory end of month	1,774,829	—11.38	2,002,692	1,774,829	2,516,928
Total Automotive Casings					
Shipments					
Original equipment	4,055,752		3,119,126	19,319,939	15,373,398
Replacement	6,032,130		5,295,979	25,197,098	20,903,897
Export	114,329		106,036	654,856	744,978
TOTAL	10,202,211	+19.73	8,521,141	45,171,893	37,022,273
Production	8,480,266	— 1.73	8,629,087	45,525,149	39,456,981
Inventory end of month	10,762,063	—12.98	12,367,338	10,762,063	13,135,434
Passenger and Truck and Bus Tubes					
Shipments					
Original equipment	4,058,925		3,115,570	19,314,787	15,351,878
Replacement	4,331,524		3,516,967	18,211,632	15,423,500
Export	68,360		55,388	369,704	502,005
TOTAL	8,458,809	+26.48	6,687,925	37,896,123	31,277,383
Production	7,536,925	+ 6.31	7,089,327	38,567,118	34,100,801
Inventory end of month	11,248,213	— 7.12	12,109,934	11,248,213	12,306,030

NOTE: Cumulative data on this report include adjustments made in prior months.
SOURCE: The Rubber Manufacturers Association, Inc., New York, N. Y.

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